SERVICE MANUAL

DIGITAL STORAGESCOPE

DS-6121/DS-6121A

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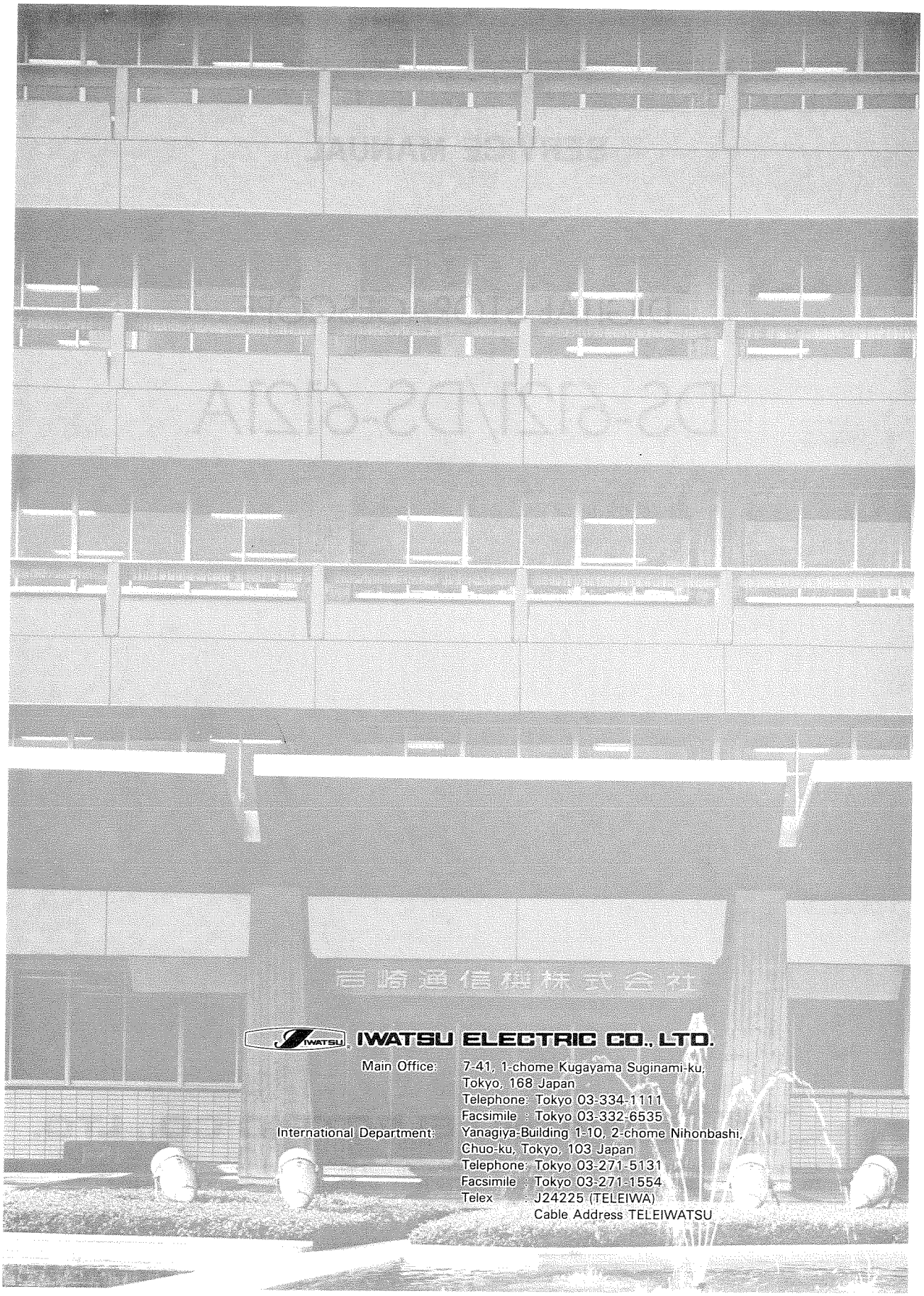

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Section 1 Specifications

1-1 GENERAL

The DS-6121/DS-6121A is an easy-to-use, high-grade oscilloscope with digital storage mode and equivalent sampling function, suitable for multiple purposes and a with range of applications.

The DS-6121/DS-6121A may also be used as a programable oscilloscope using a personal computer as a controller via the GP-IB or RS-232-C interface for research and development purposes, and also can increase the efficiency of production and inspection lines.

1-2 ELECTRICAL SPECIFICATIONS

1-2-1 Vertical Deflection System (Channels 1 and 2)

Deflection factor	
Range	1 mV/div to 5 V/div in a 1-2-5 sequence of 12 steps
	1 mV/div to 12.5 V/div, continuously variable with the VARIABLE
Accuracy I	2% at 5 mV to 5 V (10°C to 35°C)
	4% at 1 mV and 2 mV (10°C to 35°C)
Accuracy II	5% at 5 mV to 5 V (0°C to 40°C)
	8% at 1 mV and 2 mV (0°C to 40°C)
Input RC	Direct: 1 MΩ± 1.5%//25 pF ±2 pF
	With probe: 10 MΩ±2%//14 pF ± 2 pF
Maximum input voltage	±250 V MAX
Input coupling	AC, DC, GND
Common mode rejection ratio	50:1 (1 kHz sine wave)
Inversion	CH 2 only

1-2-1-1 Nonstorage (Real)

Frequency response			
Bandwidth	5 mV/div to 2 V/div	DC to 100 MHz	-3 dB (10°C to 35°C)
	1 mV/div, 2 mV/div	DC to 50 MHz	-3 dB (10°C to 35°C)
	5 V/div	DC to 100 MHz	-3.5 dB (10°C to 35°C)
AC coupled low	-3 dB Point 4 Hz		
Rise time	Approximately 3.5 ns at 10 mV/div		
Vertical mode	CH 1, CH 2, ALT, CHOP (switching rate: approximately 500 kHz), ADD		

1-2-1-2 Storage

Frequency response	
One shot	
Curve interpolation OFF	DC to 10 MHz (1-channel operation)
	DC to 5 MHz (2-channel operation)
Equivalent sampling	DC to 100 MHz
Envelope (DS-6121A)	DC to 10 MHz -3 dB (10°C to 35°C)
Vertical mode	CH 1, CH 2, CH 1 & CH 2, CH 1 CH 2 & REF

1-2-2 Triggering

A TRIGGER

Sensitivity

Maximum trigger level (10°C to 35°C)

Frequency Range	Level	
	CH 1, CH 2	EXT
DC to 10 MHz	0.4 div	0.1 V
Up to 50 MHz	1.0 div	0.1 V
Up to 100 MHz	1.5 div	0.1 V

<Note>

- Trigger signals are attenuated in the following frequency ranges depending on coupling
  AC 100 Hz or lower
  HF REJ 10 kHz or higher
  LF REJ 10 kHz or lower
- Auto sweep mode: The lower usable frequency is 50 Hz
- TV-V, TV-H synchronizing signal level: 1 div or more on screen amplitude for a composite video signal composed of 7 parts video signal and 3 parts synchronizing signal

Source: CH 1, CH 2, EXT, NORM, LINE
AC, DC, HF REJ, LF REJ, TV-V

Slope: +, -

External trigger input

Maximum input voltage: ±250 V MAX

Input RC: 1 MΩ ± 3%//25 pF ± 5% (Both A and B COUPLINGs are DC)
1.2 MΩ ± 3%//25 pF ± 5% (Either A or B COUPLING is DC)
1.5 MΩ ± 3%//25 pF ± 5% (Neither A nor B COUPLING is DC)

B TRIGGER

Minimum trigger level: Same as in A TRIGGER Table

Source: RUN AFTER DELAY, CH 1, CH 2, EXT

Coupling: AC, DC, HF REJ, TV-H

Slope: +, -

External trigger input: Same as A TRIGGER

1-2-3 Horizontal Deflection System

Sweep mode	AUTO, NORM, SINGLE
Sweep magnification	10 times
Accuracy I	20 nsec/div and 50 nsec/div 6% (10°C to 35°C)
(Over center 8 divisions)	0.1 μsec/div to 0.1 sec/div 3% (10°C to 35°C)
Accuracy II	20 nsec/div and 50 nsec/div 7% (0°C to 40°C)
(Over center 8 divisions)	0.1 μsec/div to 0.1 sec/div 5% (0°C to 40°C)
Holdoff time	Continuously variable

1-2-3-1 Nonstorage (Real)

HORIZ DISPLAY	A, A INTEN, A INTEN & B (DLY'D), B (DLY'D), X-Y
A SWEEP	
Sweep time	20 ns/div to 0.1 s/div in a 1-2-5 sequence of 21 steps
Accuracy I	2% (10°C to 35°C)
(Over center 8 divisions)	
Accuracy II	4% (0°C to 40°C)
(Over center 8 divisions)	
Roll mode	0.2 s/div to 10 s/div
B SWEEP	
Delay	
Continuous delay	CH 1, CH 2, EXT
Triggered delay	RUN AFTER DELAY
Sweep time	20 ns/div to 0.1 s/div in a 1-2-5 sequence of 21 steps
Accuracy I	2% (0°C to 40°C)
(Over center 8 divisions)	
Accuracy II	4% (0°C to 40°C)
(Over center 8 divisions)	
Delay jitter	1/10,000 or less

1-2-3-2 Storage

HORIZ DISPLAY	A, A INTEN, B (DLY'D), X-Y
A Sweep Time	
Single shot	20 ns/div to 10 s/div and EXT
Equivalent sampling	
1 channel	20 ns/div to 2 μs/div
2 channels	20 ns/div to 5 μs/div
B Sweep Time	Same as Nonstorage

1-2-4 X-Y Operation

1-2-4-1 Nonstorage (Real)

X AXIS	
Input connector	CH 1
Deflection factor	Sams as that of CH 1
Bandwidth	DC to 2 MHz
Y AXIS	
Input connector	CH 2
Deflection factor	Same as that of CH 2
Bandwidth	Same as that of CH 2
X-Y Phase Defference	3° or less (DC to 100 kHz)

1-2-4-2 Storage

X axis	CH 1 or REF 1
Y axis	CH 2 or REF 2

1-2-5 Z-axis

Sensitivity	0.5 Vp-p or more
Slope	Positive-going signal decreases intensity
Bandwidth	DC to 5 MHz
Input resistance	10 kΩ ± 20%
Maximum input voltage	±50 V MAX

1-2-6 CRT Read Out and Cursor Measurement

CRT read out	The following parameters are displayed CH 1 deflection factor, CH 2 deflector factor A trigger level, B trigger level A SWEEP time, B SWEEP time, DELAY TIME MULTI, HOLDOFF time (%) REF 1 deflection factor, REF 2 deflection factor Various modes (Intplting, Equ-sampling, etc.)
Cursor measurements	Voltage measurement Voltage ratio (displayed in dB and %) Time measurement Phase measurement Voltage on waveform measurement

1-2-7 CRT Display

Shape	Rectangular, 6 inches
Display area	8 div × 10 div (1 div = 10 mm)
Phosphor	B31
Accelerating voltage	Approximately 20 kV

1-2-8 Set Up Function

No. of memories	4
Kinds	Set up memory 4
	Set up in the state of power OFF
	Set up in the state of final waveform capture before power OFF (Valid for STORAGE only)
	Default

1-2-9 Digital Storage

A/D converter	
Resolution	8 bits, 25 levels/div
Maximum clock rate	1 channel operation: 40 MHz
	2 channel operation: 20 MHz
Memories	
Capture memory	2048 words × 2 channels
Display memory	512 words × 4 traces
No. of waveforms that can be saved	4
No. of averagings	2, 4, 8, 16, 32, 64, 128, 256
Interpolation function	Curve interpolation
	Step interpolation
	Vector interpolation for displayed waveform
Calculation functions	CH 1 + CH 2
	CH 1 - CH 2
	CH 1 × CH 2
GO/NO GO judgement	
Area setting	4 cursors
	2 waveforms and 2 cursors
	In addition, IN and OUT ranges can be selected; FREEZE IF NO GO or CONTINUE can be selected.
Waveform output	
X-Y recorder	Automatically draws scales
Plotter	GP-IB or RS-232-C interface pack and Iwatsu SR-6620, SR-6602 or SR-6625
Waveform enlarging	
Vertical	× 1/10 to × 10
Horizontal	× 1 to × 100
Data positions	FULL POST (Delay 0)
	POST (Delay -1/8)
	CENTER (Delay -1/2)
	PRE (Delay -7/8)

1-2-10 Single Output

Calibrators	
Output voltage	0.6 V
Accuracy I	1% (10°C to 35°C)
Accuracy II	1.5% (0°C to 40°C)
Waveform	Square wave
Repetition frequency	1 kHz
Accuracy I	1% (10°C to 35°C)
Accuracy II	1.5% (0°C to 40°C)
Output current	10 mA
Accuracy I	1.5% (10°C to 35°C)
Accuracy II	2% (0°C to 40°C)

1-2-10-1 Nonstorage (Real)

CH 1 signal output	
Output voltage	30 mV ±20% per division of displayed signal (with 50 Ω load)
Frequency response	DC to 50 MHz -3 dB
Output resistance	50Ω ±20%
A gate output	
Output voltage	Approximately ±5 V (reference votlage: About 0 V)
Output resistanceq	Approximately 2.7 kΩ
B gate output	Same as A gate output

1-2-10-2 Storage

PEN Y signal output	
Output voltage	Approximately 0.2 V per division of displayed signal
Output resistance	1.1 kΩ ±20%
PEN X signal output	Same as Y signal output
PEN UP/DOWN output	
Output voltage	Approximately +5 V (reference voltage: About 0 V)
Output resistance	600 Ω ±20% at 0 V
	2.9 kΩ ±20% at 0 V
GO/NO GO judgement output	
Output voltage	Approximately +5 V (reference voltage: About 0 V)
Output resistance	1 kΩ ±20% at 0 V
	3.3 kΩ ±20% at +5 V

1-2-11 Battery Back Up

Back up item	ALL SET UP and 4 Waveform Memories
Back up time	10 days (-20°C to +70°C)

1-2-11 Battery Back Up

Back up item	ALL SET UP and 4 Waveform Memories
Back up time	10 days (-20°C to +70°C)

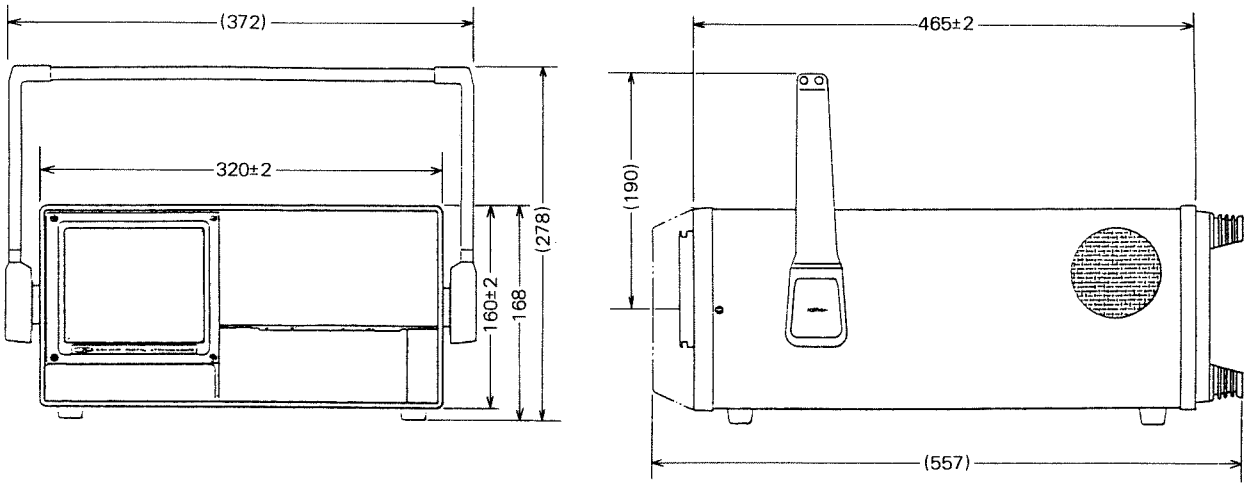
1-2-12 Power Supply

Voltage range	90V to 250 VAC
Bandwidth	50 to 440 Hz
Power consumption	DS-6121 Approximately 120 W (at 100 VAC)
	DS-6121A Approximately 130 W (at 100 VAC)

1-3 DIMENSIONS AND WEIGHT

Weight	Approximately 13 Kg
Dimensions	320±2 (W) × 160±2 (H) × 465±2 (L) [mm]

Figure 1-3. Dimensions



1-4 ENVIRONMENTAL CHARACTERISTICS

Operating temperature	0°C to 40°C
Operating humidity	40°C, 90% relative humidity
Storage temperature	-20°C to +70°C
Storage humidity	70°C, 80% relative humidity
Altitude	Operating: 5,000 m maximum (atmospheric pressure 405 mmHg) Non-operating: 15,000 m maximum (atmospheric pressure 90 mmHg)
Vibration	From 10 Hz to 55 Hz and back in 1 minute; double amplitude 0.63mm; for 15 minutes each in vertical, horizontal, and longitudinal directions for a total of 45 minutes.
Impact	One side is raised to an elevation angle of 30° (10 cm maximum), and let fall on a piece of hard wood. Each side is put to this test 3 times.
Drop	A package ready for transportation is dropped from a height of 60 cm.

1-5 ACCESSORIES

Power cord 1
Fuse TSC 3A 250 V 2
Probe (SS-0012R) 2
Accessories bag 1
Panel cover 1
Dust cover 1
Manual sheet 1
Instruction manual 1

Section 2 Circuit Description

2-1 GENERAL DESCRIPTION

This section describes the operating principle of the DS-6121/DS-6121A.

The DS-6121/DS-6121A digital storagescope is a 100 MHz oscilloscope incorporating A/D converters. It is provided with full remote-control capability and all the analog signal control operations from its control panel are performed via microprocessors, using relays, analog switches and D/A converters.

Figure 2-1 shows the block diagram.

Vertical Deflection System

Preamplifier

The vertical deflection system has two independent preamplifiers. The amplifiers for CH 1 and CH 2 combine [VOLTS/DIV] and [VARIABLE] to permit input deflection factor setting from 1 mV to 12.5 V per division of the graticule scale. As an input signal is applied to the INPUT connector for each channel, it is converted to a balanced signal, which is amplified and led to the delay cable driver circuit. The signals picked off from the vertical preamplifier and led to the A/D converter.

Delay Cable Driver Circuit

The delay cable driver circuit leads the balanced signal from each preamplifier to the vertical main amplifier individually or by time division through diode gate opening and closing (switching circuit).

Modes of leading the balanced signal can be selected by setting the [MODE] : CH 1 or CH 2 independent, display of the sum of CH 1 and CH 2 or the difference between them, two-channel (CH 1 and CH 2) display by time division.

Two channel display by time division comes in two modes of operation: ALT and CHOP. ALT is the mode for changing display channels for every sweep of horizontal axis, and CHOP is the mode for changing display channels for every 500 kHz by the pulse from clock generator circuit.

In the CHOP mode, a chop blanking pulse is applied to the Z-axis amplifier to erase the transient phenomenon during channel switching.

The selected display signals are guided to the delay cable.

The delay cable delays the pressing signal by about 100 ns. The delayed signal is guided to the vertical output amplifier.

Vertical Main Amplifier

The vertical main amplifier is used for driving the electron beams which scan the fluorescent face of the CRT screen in the vertical axis (Y-axis) direction, and amplifies input signals up to the inherent deflection factor of the CRT to make the vertical input deflection factor correspondent to the CRT scale.

The real-time waveforms and stored waveform characters are switched in the main amplifier, which also outputs the equivalent sampling signal for the A/D converters.

Triggering

Trigger Signal Circuit

The signals picked off from the vertical preamplifiers are led to the trigger signal amplifier circuits via trigger signal switching circuits for CH 1, CH 2, EXT, LINE (from the power circuit) and NORM (from the main amplifier after its electronic switching) signals.

A and B Trigger Amplifier Circuits

The signals applied to the vertical preamplifiers are picked off and led to the A and B trigger amplifier circuits. Before reaching these amplifier circuits, however, the lowpass filter or highpass filter can be selected.

These trigger signals are applied to the A or B trigger amplifier circuit, where the signals are amplified to the proper sensitivity. The amplified signals are led to the sweep circuit via the pulse shaping circuit, which converts them to trigger pulses having a constant rise time and voltage.

TV Trigger Signal Separator Circuit

Suppose that a television composite signal is applied to the vertical preamplifier. If the input is directly applied to the trigger signal amplifier circuit as it is, stabilized synchronization cannot be expected because the video signal component changes. Thus, the video signal component is removed by feeding the input through the TV trigger signal separator circuit, and the vertical trigger signal (TV-V) and horizontal trigger signal (TV-H) are separated by the time constant circuit composed of a resistor and capacitor. And after it, the stabilised synchronization is assured.

In TV trigger delay sweep, a horizontal trigger component is applied to the B trigger amplifier circuit.

Horizontal Deflection System

A and B Sweep Generator Circuits

The pulse generated by the A trigger pulse shaping circuit is applied to the A sawtooth generator circuit, and a sawtooth signal for horizontal axis sweep is generated when the sweep gate opens.

The B sawtooth generator circuit generates a sweep signal at a preset time after the operation of the A sawtooth generator circuit. The sweep by sawtooth B is called delayed sweep, which may be sawtooth B is called delayed sweep, which may be classified by the start timing of the B sawtooth generator circuit as follows:

Continuous delay sweep: Sawtooth B is generated when a pulse signal is generated by comparison of the voltage set with sawtooth A.

Triggered delay sweep: Sawtooth B is generated by the first trigger signal B that reached after generation of a pulse signal by comparison of the voltage set with sawtooth A.

As described above, sawtooth waveforms are generated by opening and closing the sweep gates, and sweep gate signals A and B generated at that time are led to the Z-axis amplifier.

Sawtooth waveforms A and B are output to the A/D converters for use in equivalent sampling.

Horizontal Amplifier

The horizontal amplifier drives the electron beams which scan the fluorescent face of the CRT in the horizontal axis (X-axis) direction, and amplifies the input signals up to the inherent deflection factor to the CRT so that the trigger signals from the A and B sweep generator circuits will correspond to the time axis scale on the CRT screen.

Sweep signal A or B may be selected for the horizontal amplifier with the HORIZ DISPLAY A or A INTEN and B (DLY'D) input sweep signal A and sweep signal B respectively to the horizontal amplifier.

In ALT operation, sweep signals A and B are alternately selected by electronic switching every sweep, and input to the horizontal amplifier.

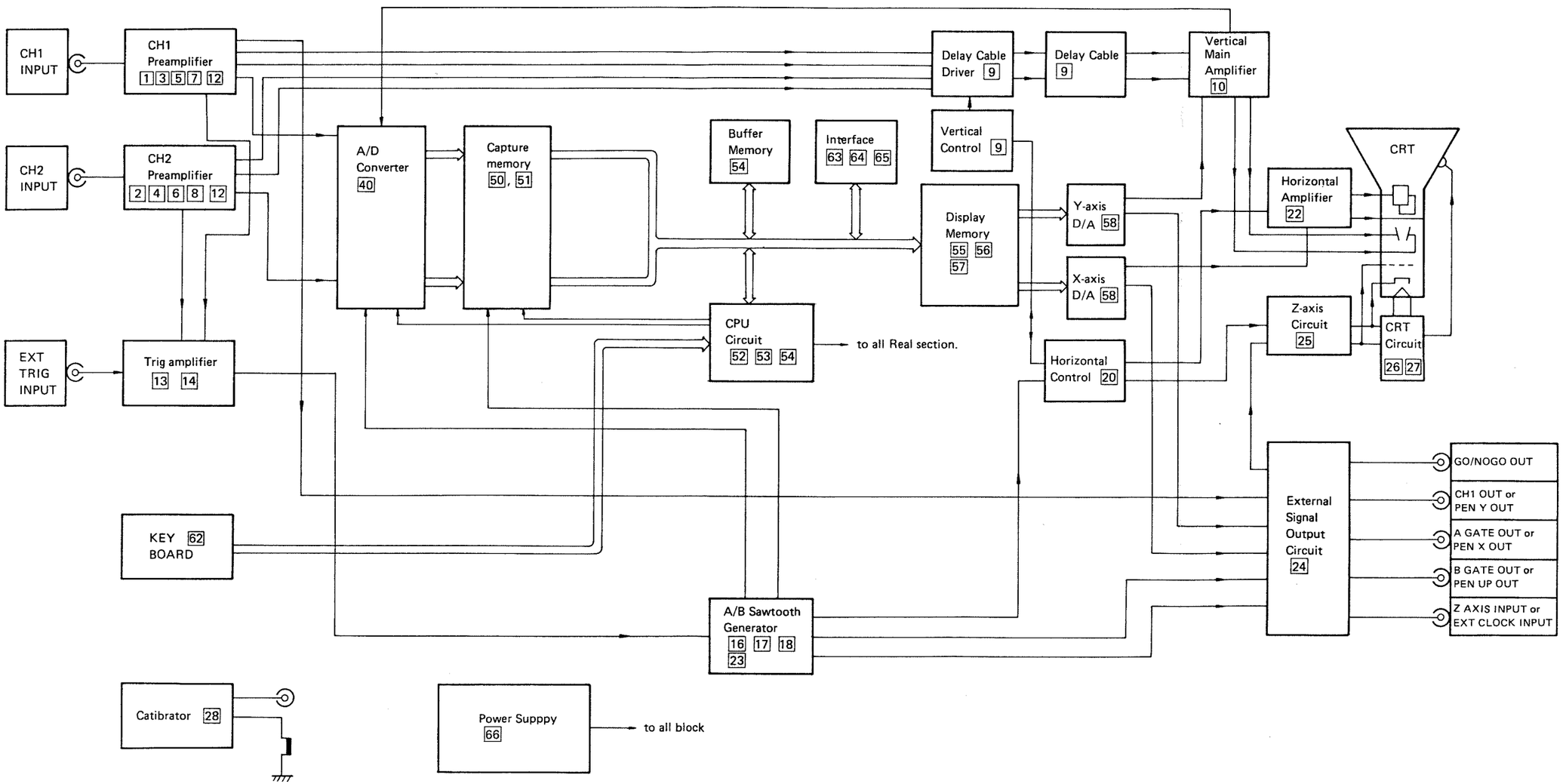
In X-Y operation, the signal input to the vertical preamplifier for CH 1 INPUT is led to the horizontal amplifier via the trigger amplifier and the signal applied to CH 2 INPUT is led to the vertical amplifier. Thus, a Lissajours' figure can be displayed on the screen, by the signal applied to CH 1 INPUT (X-axis display) and the signal applied to CH 2 INPUT (Y-axis display).

The horizontal amplifier is also used to switch the character signal to the sweep signal. In the storage mode, it is switched to the X-axis D/A output signal which is output from the horizontal amplifier.

External Signal Output Circuit

This circuit inputs and outputs signals by switching the real-time mode and storage mode signals.

Figure 2-1. Over All



Z-axis and CRT Circuit

Z-axis amplifier

The Z-axis amplifier selects gate pulses from the A and B sweep generator circuits, amplifies the selected pulse, and generates a CRT intensity modulation signal. These gate pulses are called unblanking pulses because they eliminate retrace line.

The unblanking pulses very in waveform according to HORIZ DISPLAY position. An unblanking pulse is generated from an A-gate waveform in the A sweep mode, from a combination of A-gate and B-gate waveforms in the A INTEN mode, and from a B-gate waveform in the B (DLY'D) sweep mode. In ALT sweep, unblanking pulses with the INTEN waveform and B-sweep waveform are alternately provided to the HORIZ DISPLAY by electronic switching every sweep, and input to the Z-axis amplifier.

The unblanking pulse in the storage mode is generated by the character circuit and applied to the Z-axis amplifier.

The character INTEN signal is switched with the A/B gate signal in the Z-axis amplifier.

In addition, the aforementioned chop blanking signal for erasing the transient phenomenon during chopping, and the signal applied to Z AXIS INPUT for intensity modulation from the outside are also provided to the Z-axis amplifier input.

If a positive signal of 0.5 V or more is applied to Z AXIS INPUT, the CRT luminance lowers to permit intensity modulation. The INTEN control for adjusting overall intensity is also connected to the Z-axis amplifier input.

CRT circuit

The CRT circuit consists of a circuit which generates heater voltages and high voltages for generating and accelerating electron beams, and grid circuits around the CRT for proper focusing.

Power Supply and Calibrator

Power supply

The power supply circuit generates the stabilized low voltage from commercial AC power to drive each circuit, and also supplies a line trigger signal to synchronize with the commercial AC power and the CRT scale illuminating power.

Calibrator

This is a constant-voltage constant-current square wave generator, and is set to a repetition frequency of about 1 kHz. Using the signal generated by this circuit, probe phases can be adjusted and oscilloscope input sensitivity can be calibrated. Current probe phases can also be adjusted by means of the current loop in the rear panel.

Others

A/D converter

8-bit, 20-megasamples/sec A/D converters are used in the two channels for digitization of analog signals from the real-time oscilloscope block. The A/D converter block also includes the equivalent sampling clock generator circuit.

CPU circuit

The CPU circuit is used for overall control of the unit using a microprocessor and ROM/RAM memories. The set data of the real-time oscilloscope is transferred as serial data. The CPU circuit also includes the clock generator circuit, storage mode timing control circuit and panel interface.

Capture memory

The capture memory is used for the storage of data digitized by the A/D converters. This block also includes high-speed, 8-bit × 2048-word RAMs for the two channels, and the address/data timing control circuits for the RAMs.

Buffer memory

This stores the data from the capture memory, and transfers data to the waveform display memory and interface.

Display memory

This generates data to be displayed on the CRT, and transfers the waveform data, cursor data and character data from the character generator to the X·Y-axis D/A converter.

X·Y-axis D/A converter

This converts CRT display data from the display memory into an analog signal, and supplies it to the horizontal and vertical amplifiers. This block also supplies the X·Y recorder output signal.

Interface

Either an GP-IB or RS-232-C interface unit can be incorporated for waveform input/output, panel operation and status output. This block includes the interface controller and data input/output buffer circuits.

2-2 VERTICAL DEFLECTION SYSTEM

2-2-1 Signal Input and Attenuator [1], [2]

A signal to be measured is either a very low-voltage, or a high-voltage, or ac voltage, or dc voltage, or a voltage of ac superposed on dc. The [VOLTS/DIV] is available to guide these signals either to the attenuator that amplifies the signal to an easy-to-observe amplitude. The [V COUPL] is selected the AC or DC connection to reject dc component, or to press all components.

Using a probe or cable, the signal to be measured is applied to the INPUT connector. The maximum input voltage is 250 V (DC + peak AC) when the signal is directly applied via cable, and 600 V (DC + peak AC) when the signal is applied via a probe (10 : 1).

The [V COUPL] selects the type of the input coupling according to the signal applied to the connector. When setting to AC, the input circuit of the vertical deflection system is made the ac coupling by C0101, so that dc component, if any, is blocked from the input signal and only ac component is passed.

When setting to DC, the dc coupling is provided, thereby to pass the all frequencies including the dc component of the input signal.

When setting to GND, the input signal is not connected to the attenuator, and the input of the attenuator is grounded. Thus, in this case, the input signal is not grounded, and therefore, the ground potential is easy to check.

There are two attenuator circuits; the 1 MΩ attenuator attenuation ratios are 1/1, 1/10 and 1/100.

2-2-2 Preamplifiers [1], [2], [3], [4], [5], [6], [7], [8]

The input signal must be amplified to the amplitude of the CRT's vertical deflection factor corresponding to the value set by the attenuator. The input signal, therefore, is amplified in the prestage; it is converted to the balanced signal and amplified by the symmertical amplifier.

In this case, in order to amplify the frequency of the input signal to the wide bandwidth the amplifier is converted to a low-impedance output. The amplifier for this purpose is the preamplifier.

The preamplifiers for CH 1 and CH 2 have the circuit configuration as shown in Figure 2-2-2. The high-frequency component of the output signal is applied to the low-impedance converter Q0101 via the attenuator.

The low-frequency component of the input signal is cut by C0113, synthesized in IC0105 and input to the low-impedance attenuator, which is switchable to 1/1, 1/2 and 1/5. The attenuated signal is applied to the amplifier via the input stage of Q0301 and Q0302 for the conversion into a balanced signal.

After being amplified by approximately 2.5 times by Q0301 to Q0310, the signal is input to 8-bit D/A converter IC0303 for the continuous attenuation of 1/2.5 or less under the control of the source-drain resistance of FET Q0313. The attenuated output is taken out as a single output by the amplifier of Q0505 to Q0508, supplied to emitter-followers Q0512 and Q0513 and output as CH 1-TRIG and CH 1-OUT.

A 12-bit D/A converter is connected to the output of grounded-base amplifier of Q0501 and Q0502 to control the position. The output is supplied to the grounded-base amplifier of Q0703 and Q0704, amplified by balanced-single conversion amplifier of Q0707 to Q0712, and output as the CH 1 A/D converter input signal.

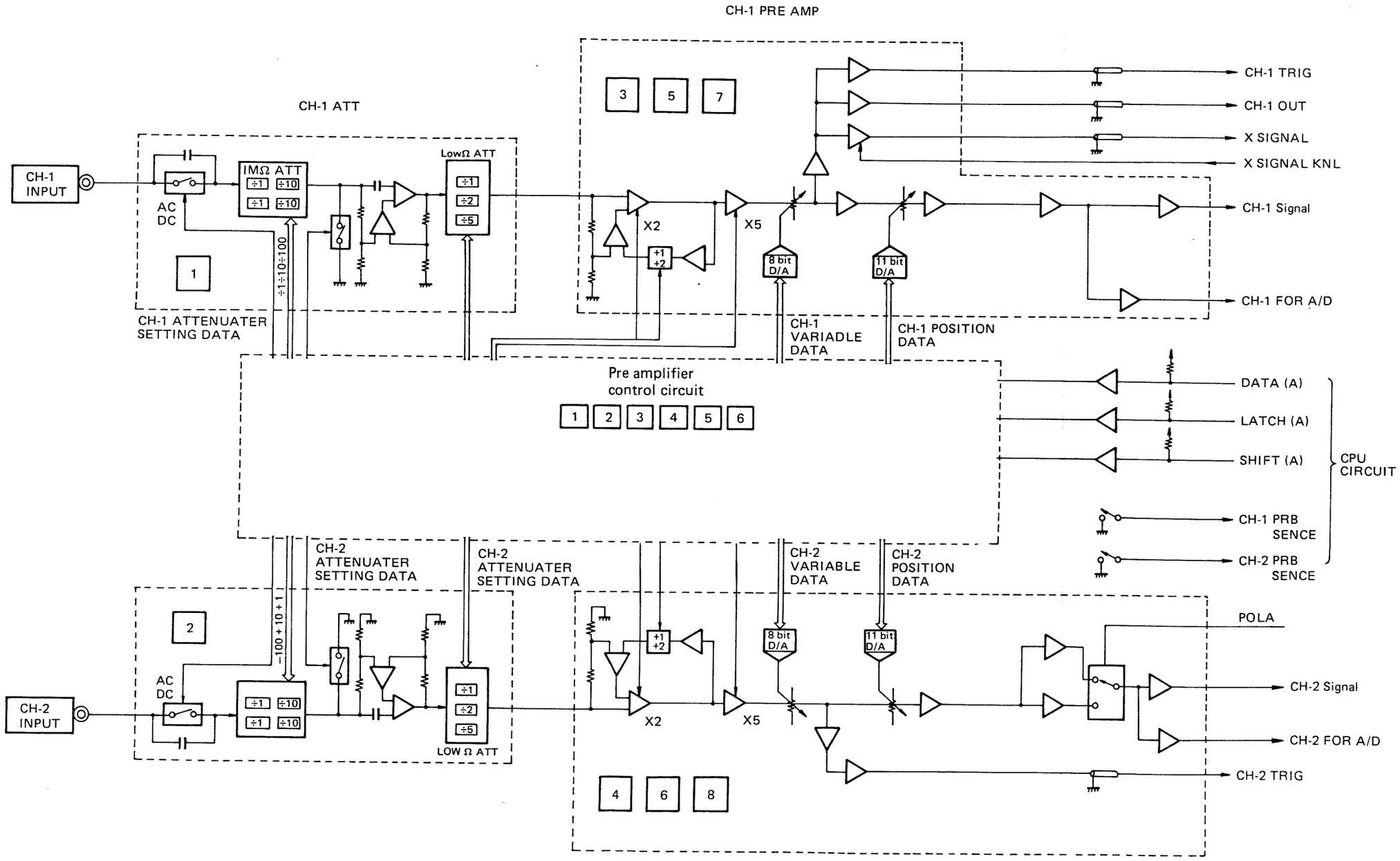
The configuration for CH 2 is similar to CH 1, except that the CH 2 polarity is inverted by Q0801 to Q0804.

The signal amplified by Q0705 and Q0706 is input to the vertical switch.

2-2-3 Preamplifier Control [01], [02], [03], [04], [05], [06]

The 72-bit serial data transferred from the CPU circuit is latched by the shift registers of IC0101, IC0102, IC0201, IC0202, IC0304, IC0404, IC0501, IC0601 and IC0603, so that the attenuator and preamplifier are controlled by parallel data.

Figure 2-2-1. Block Diagram of Attenuator and Preamplifiers



2-2-4 Vertical Mode 09

CH 1: When VERTICAL MODE is set to CH 1, the emitter level of Q0905 becomes high, CH 1 diode switches D0902 and D0903 turn ON, and the emitter level of Q0904 becomes low to turn off the CH 2 circuitry.

CH 2: When VERTICAL MODE is set to CH 2, the emitter level of Q0904 becomes high, CH 2 diode switches D0904 and D0905 turn ON, and the emitter level of Q0905 becomes low to turn off the CH 1 circuitry.

The above operations are performed by controlling the preset and clear terminals of flip-flop IC0904.

ALT: The V. ALT PULSE is selected by IC0905 and input to the clock terminal of IC0904, so that the alternative inversion of IC0904 outputs Q and $\bar{Q}$ switches CH 1 and CH 2.

CHOP: Similarly to ALT above, the CHOP 1 MHz pulse is input to IC0904 so that CH 1 and CH 2 are switched by 500 kHz.

ADD: When VERTICAL MODE is set to ALT, both the CH 1 and CH 2 diode bridges turn on, Q0912 turns on, and the diode bias current flows.

2-2-5 Delay Cable 09

The delay cable drive amplifier stated before, together with the post-stage amplifiers of CH 1 and CH 2 preamplifiers, constitute the composite amplifier. This composite amplifier makes low impedance by the negative feedback with R0909 and R0911 or R0910 and R0912, to prevent degradation of frequency characteristics due to complex circuit configuration, and guides the signal to the delay cable.

The delay cable is inserted to delay the transmission time of the vertical axis so that the signals applied from the input of vertical axis will reach the vertical deflection plate and horizontal deflection plate almost simultaneously.

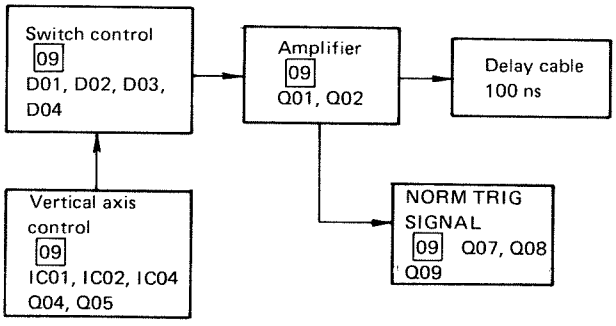
In order to observe the leading edge of the input signal waveform by the internal trigger, this device requires a delay time of about 100 ns.

2-2-6 Delay Cable Drive Amplifier 09

The amplifier receives the output signal of the preamplifier of CH 1 or CH 2, and guides the signal to the switching circuit, so that he vertical axis mode is controlled by the vertical axis control circuit.

The balanced signal from the switching circuit is amplified by the next delayed cable drive amplifiers Q0901 and Q0902. The amplified signal is guided to the delay cable, where the transmission time of the vertical axis is delayed, then is applied to the main vertical amplifier (the last stage amplifier). The output of the drive amplifier also is picked off and shaped into NORM TRIG signal, then guided to SOURCE .

Figure 2-2-6. Delay Cable Drive Amplifier



2-2-7 Vertical Main Amplifier [10]

The vertical output amplifier, by means of the balance amplifier, amplifies the output signal from the delay cable, and converts the low-impedance input to a high-impedance output, then further amplifies the output to a sufficient amplitude to be deflected in the vertical direction of CRT, and applies to the vertical deflection plate of CRT.

The R1003 is the variable resistor to compensate for impedance matching distortion between the delay cable and the amplifier.

The variable capacitors C1014 between the emitters of Q1005 and Q1006 as well as the variable resistor R1029, R1030 comprise the compensation circuit to prevent ringing of other distortion from appearing in the signal waveform.

The equivalent sampling signal for the A/D converter is extracted from the emitters of Q1001 and Q1002. The equivalent sampling amplifier consists of Q1040 to Q1048 for the balanced-single conversion. The waveform is compensated by variable capacitors C1035 and C1036 inserted between the emitters of Q1042 and Q1043 and by variable resistor R10121.

For a stored-waveform or character display, the real-time waveform is switched by the single-balanced conversion amplifier consisting of Q1026 to Q1031.

2-2-8 Signal Switch for A/D Converter [12]

After balanced-single conversion by the pre-amplifier, the CH 1 and CH 2 signals are input to the A/D converter block via the switching circuit consisting of Q1201 to Q1204, Q1209, Q1201, Q1212 and Q1213.

The level of the FET switch controlling signals is converted by IC1202 and IC1203 from the TTL level to the level that can turn the FETs on and off. In the storage mode with the vertical mode set to CH 1/CH 2, the CH 1 signal is output via Q1201, Q1206, Q1290 and Q1214, and CH 2 signal is output via Q1201, Q1207, Q1213 and Q1215.

With the vertical mode set to CH 1 and sweep rate set to more than 5 µs/div, Q1209 and Q1212 turn on Q1214 and Q1215 simultaneously output the CH 1 signal. Similarly, with the vertical mode set to CH 2 and sweep rate set to more than 5 µs/div, Q1210 and Q1213 turn on the Q1214 and Q1215 simultaneously output the CH 1 signal. The cffset is defected in the above modes. The result is output by turning Q1201 and Q1203 off and turning Q1202 and Q1204 on.

2-3 TRIGGERING

2-3-1 A and B Trigger Signal Amplifier 13, 14, 15

The trigger signal amplifier is as shown in Figure 2-3-1.

The trigger signal amplifier permits the user to select the trigger source with SOURCE or to select the coupling of the trigger source and the trigger amplifier with COUPLING . It is also used to amplify the selected trigger signal to a sufficient amplitude as the trigger pulse signal. Also, it serves as the circuit to separate TV-V and TV-H sync pulses from the composite video signal so that the TV composite video signal can be synchronized stably.

Source

The COUPLING is used to select the trigger signal source.

CH 1 and CH 2: CH 1 and CH 2 the signal applied to the input of vertical axis is period off and connected.

EXT: For EXT, the signal input to EXT TRIG INPUT is used for triggering.

NORM: The signal displaying on the screen according to the vertical axis mode will become the trigger signal.

LINE: The power line signal is the trigger signal, and it is convenient to observe signals such as the line frequency and higher harmonics.

RUN AFT DELAY: The B source is continuously delayed and other ranges and delayed synchronously.

The A trigger source is selected by turning one of D1301 to D1305 ON.

The B trigger source is selected by turning one of D1306 to D1308 ON.

Coupling

The COUPLING is used to select the coupling type of the trigger signal source and the trigger signal amplifier.

The coupling is switched by analog switch IC1306.

AC: The AC coupling is selected and dc component is blocked by capacitor C1302 and therefore, the trigger can be made independent of dc component.

DC: The DC coupling is selected and the trigger can be made beginning with dc.

HF REJ: C1304 and R1327 constitute a low-pass filter and attenuates frequency components of about 10 kHz or higher. This is convenient to observe signals containing high-frequency noise.

LF REJ: C1303 constitutes a high-pass filter and attenuates frequency components of about 10 kHz or lower.

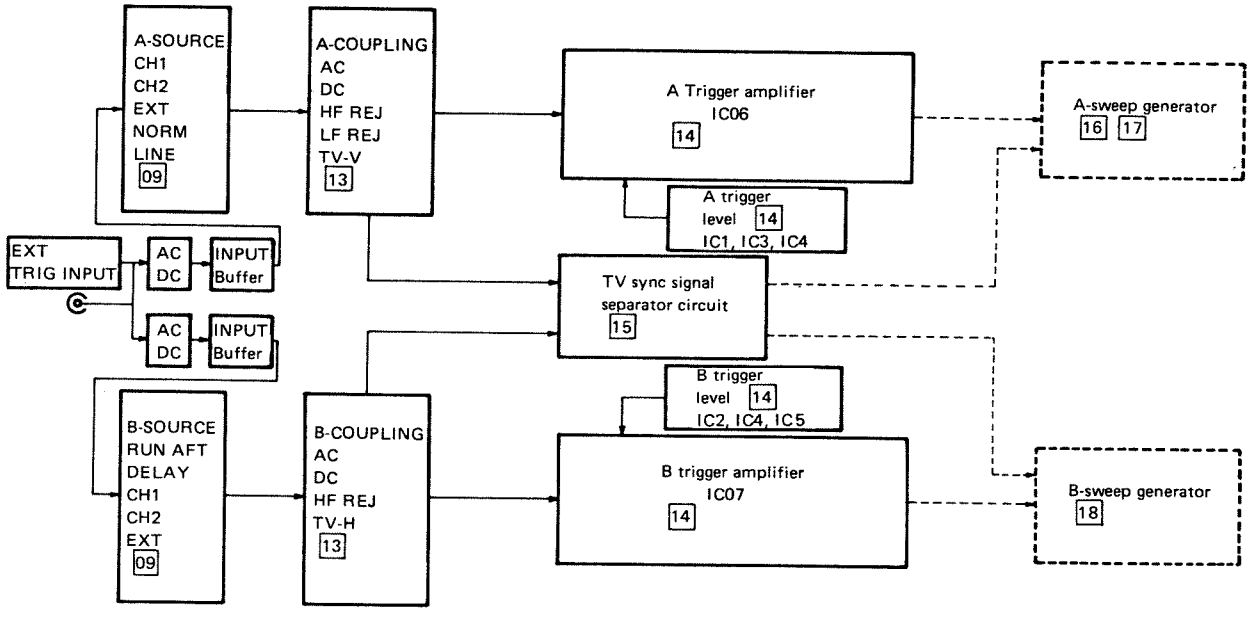
TV-V: TV-V drives the TV sync signal separator later described so that trigger is made with TV vertical trigger pulse.

TV-H: TV-H drives the TV sync signal separator later described so that trigger is made with TV horizontal trigger pulse and the composite video signal waveform between 1H can be observed.

In the trigger signal amplifier, low-frequency band components are amplified by IC1307 and high-frequency band component, after passed through C1003 is amplified respectively by prestage amplifiers IC1406. The amplified signal is guided to A or B sweep generator.

The TV sync signal is guided via COUPLING to the base of the TV sync signal separator Q1502.

Figure 2-3-1. Block Diagram of A and B Trigger Signal Amplifiers



2-3-2 TV Sync Signal Separator [15]

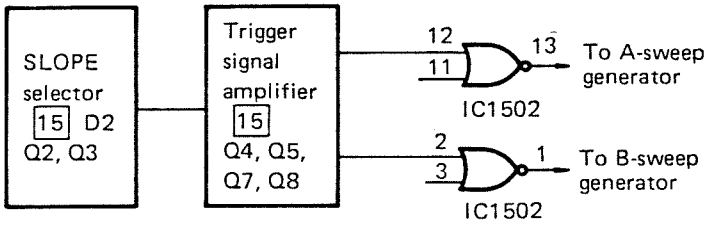
The TV sync signal separator is as shown in Figure 2-3-2. In this separator, only the sync signal is separated from the TV composite video signal and amplified, then the amplified sync signal is separated into the horizontal sync signal TV-H and the vertical sync signal TV-V. The separated TV-V pulse signals are guided to the A-sweep generator; the TV-H pulse signal to the B-sweep generator.

This is carried out by selecting SLOPE so that the composite video signal applied to the base of Q1502 is switched by ON/OFF operation of D1502 and Q1503. This operation determines whether the signal of the same polarity as applied to Q1502 is to be guided from the emitter or the signal of opposite polarity is to be guided from the collector.

The circuits is Q1504, Q1505, Q1507 and Q1508 remove the video signal component and amplify only the sync signal component. Of the amplified sync signal, only TV-H pulse is guided from pin 1 of IC1202 to the B sweep generator.

TV-V pulse signal is output from pin 13 of IC1502 and guided to the A-sweep generator.

Figure 2-3-2. Block Diagram of TV Sync Signal Separator Circuit



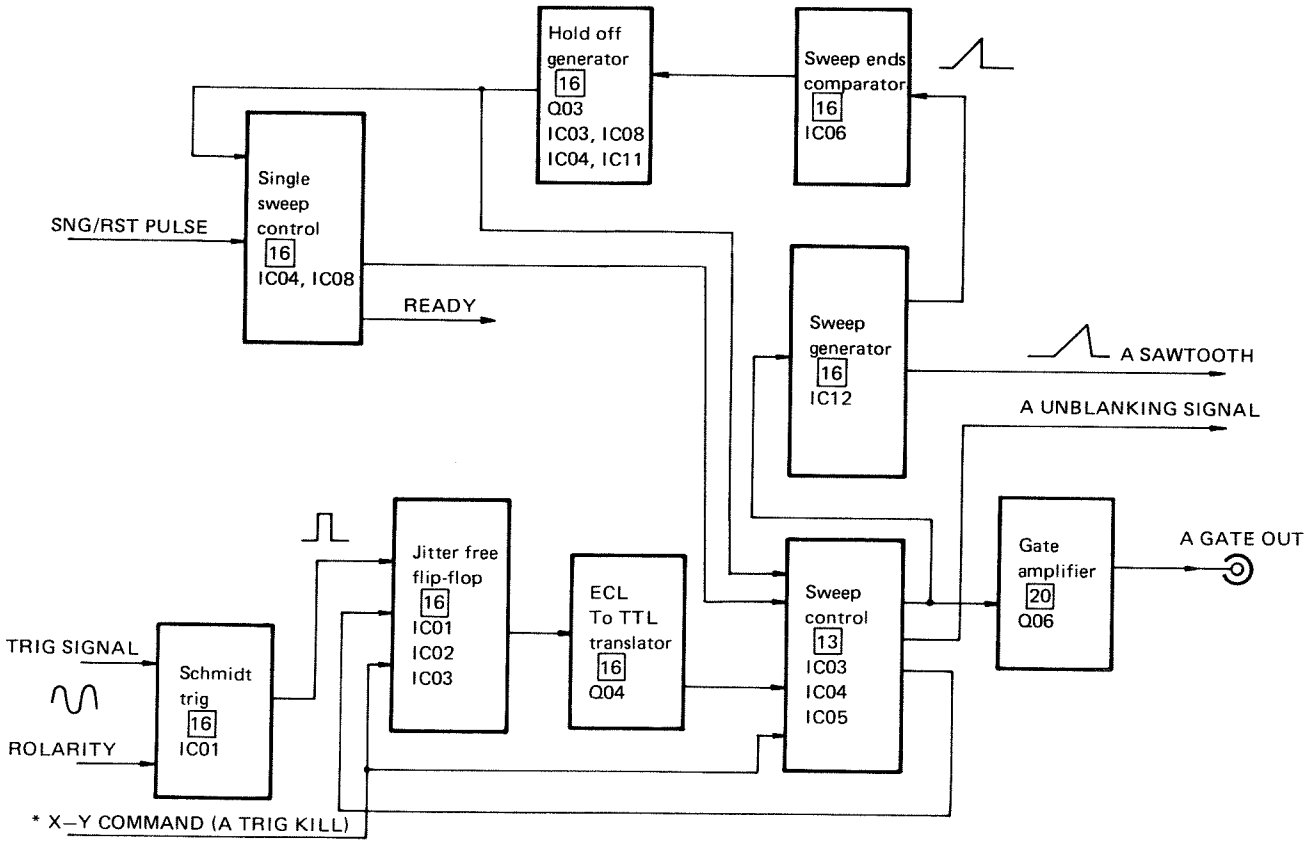
2-4 HORIZONTAL DEFLECTION SYSTEM

2-4-1 A-sweep Generator [16], [17]

The A-sweep generator is as shown in Figure 2-4-1-1.

The A-sweep generator, by trigger pulse signal, generates sawtooth-wave for sweep (trigger sweep) triggered with the signal to be measured, or sawtooth-wave for sweep (self sweep) independent of trigger signal. It also outputs unblanking signal and gate signal to brighten the traces and to erase the retraces.

Figure 2-4-1-1. Block Diagram of A-sweep Generator Circuit



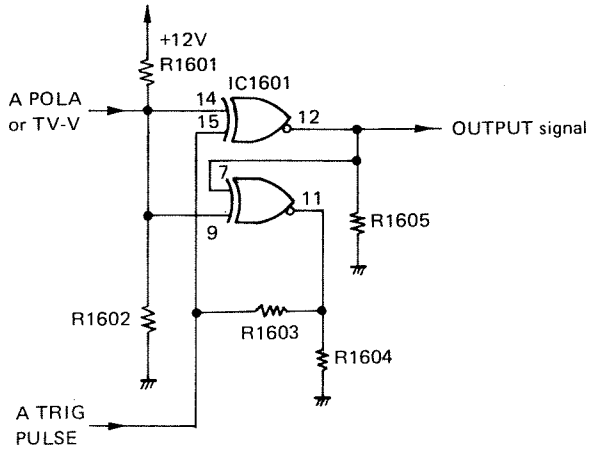
Schmidt trig

As Figure 2-4-1-2 shows, A-trigger signal and the polarity signal are applied to the Schmidt trigger comparator IC1601. The A of IC1601 shapes the waveform and outputs the trigger pulse signal. The B of IC1601 switches the polarity of the trigger signal. The shaped trigger pulse signal and the polarity-changed signal are guided to the jitter free flip-flop IC1601, IC1602 and IC1603. At the A of IC1601, the size of hysterisis for shaping the trigger signal wave is determined by R1603 and the output impedance of the trigger signal amplifier (see Figure 2-4-1-3).

Jitter free flip-flop

As Figure 2-4-1-3 shows, from the jitter free flip-flop circuits IC1601, IC1602 and IC1603, the gate signal is output at the time trigger pulse is received during waiting for sweep, and the sweep waiting condition is resumed when HOLD OFF signal is released. If the trigger pulse signal is repeated fast (about 1 MHz or more), a double trigger operation occurs; and if slow, a single operation occurs (see Figure 2-4-1-4). Note, however, that if the trigger pulse signal is input during X-Y operation, the gate pulse is not output, and the sweep mode becomes normal condition. The gate signal is output from the pin 15 of IC1602 and guided to the ECL to TTL converter Q1604.

Figure 2-4-1-2. Polarity Switching and Waveform-shaping Circuit



As Figure 2-4-1-3 shows, both IC1602s are D-type flip-flop and the D signal is output by the input of clock signal (trigger pulse signal). The IC1603 is a monostable multivibrator and its operation as double trigger or single trigger is determined by the repetition of trigger pulse signal (see Figure 2-4-1-4). The time constant of operation being selected is determined by R1608 and C1602. When the sweep mode is SINGLE, the D1602 clears the output of the monostable multivibrator. This means only one sweep.

ECL to TTL translator

The Q1604 causes the ECL level applied to the base to be converted to TTL level and guided to the sweep control circuits.

Figure 2-4-1-3. Jitter Free Flip-flop

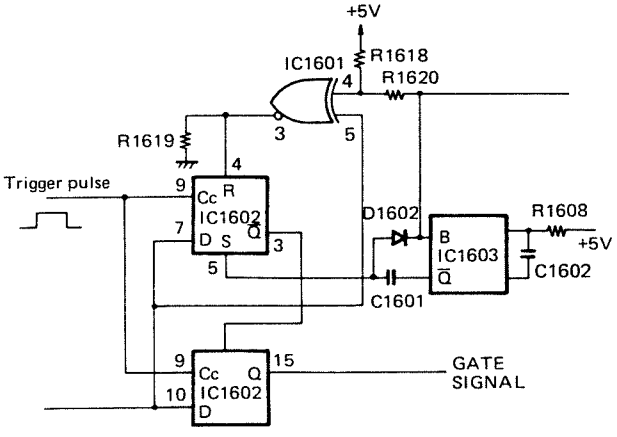
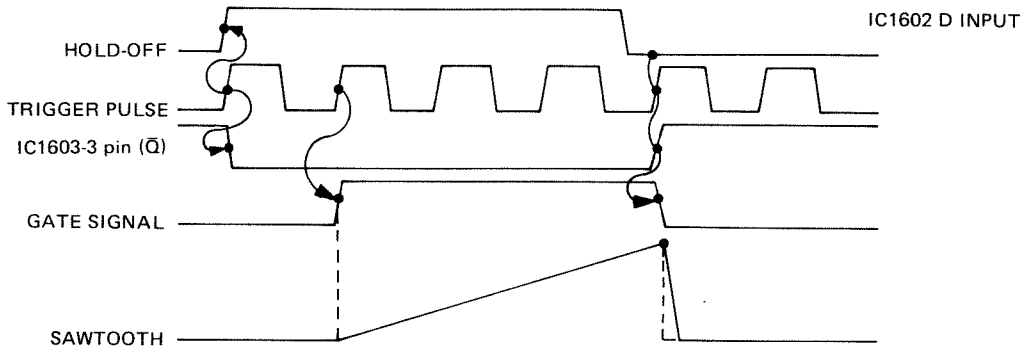
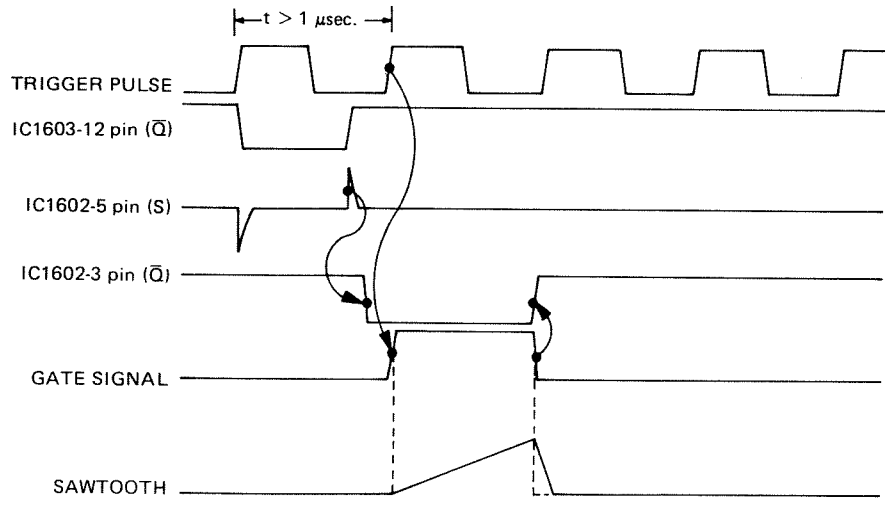


Figure 2-4-1-4. Timing Chart of Trigger Mode

○**Double Trigger Mode**



○**Single Trigger Mode**



Sweep control

The sweep control circuits IC1603. IC1604 and IC1605 are used to output the gate signal according to the sweep mode of AUTO, NORM, or SINGLE and guide the gate signal to the sweep generator and A GATE OUT terminal. The sweep control circuit outputs TRIG'D at the trigger condition, puts out the LED of TRIG'D when X-Y operation starts, and outputs HOLD OFF signal to the jitter free flip-flop circuit.

The Q1605 and C1605 speed up the trigger pulse signal by applying it to the sweep generator and the A GATE OUT.

The R1626 47 kΩ and C1609 4.7 μF are used to define the time constant (about 30 ms) when the sweep mode is set to AUTO. The IC1603 is a monostable multivibrator. It becomes self-sweep state when the sweep mode is set to AUTO and no signal is available. The moment X-Y operation occurs, the pin 3 (CLR) of IC1603 makes the pin 4 ($\bar{Q}$) of IC1603 Hi and turns LED off. The pin 9 (SWEEP ENABLE) of IC1504. When Lo, makes HOLD OFF Lo and keeps the sweep stop state. *HOLD OFF IN signal that is input to the pin 5 of IC1605 is to speed up the sweep end pulse.

When AUTO ENABLE is Lo, that is, when the sweep mode is NORM, the pin 8 of IC1605 becomes Hi; at this time, the sweep starts with *GATE SIGNAL being Lo and the sweep stops with *GATE SIGNAL being Hi. When AUTO ENABLE is Hi, that is, when the sweep mode is AUTO, pin 13 (TRIG'D) of IC1605 becomes Lo at the trigger sweep state; and the operation is the same as that at the mode of NORM. When the trigger pulse signal (with *GATE SIGNAL Hi) is applied for about 30 ms or more, the output of the pin 4 ($\bar{Q}$) of IC1603 becomes Hi, making the pin 4 of IC1605 Hi, and self-sweep is caused by *HOLD OFF IN signal applied to the pin 5 of IC1605 *HOLD OFF IN signal applied to the pin 1 of IC1603 and D1604 wait trigger pulse signal for about 30 ms after HOLD OFF signal is released (while waiting for trigger pulse signal), then self sweep starts.

The sweep generator uses the sawtooth-wave for sweeping horizontal axis (time axis) and thus comprises the sawtooth-wave generator. The sawtooth-wave generator can be set, by selecting the sweep mode, to the three kinds of AUTO, NORMAL TRIGGER, and SINGLE SWEEP operations, and depending on the operation, the following signals are generated:

- Sawtooth-wave

  This is guided to the horizontal amplifier, amplified, and applied to the horizontal deflection plate of CRT. Also it is guided to the B-sawtooth-wave generator to generate delayed pulse. It is also guided to the equivalent-sampling sawtooth-wave generator.
- Unblanking signal

  This brightens the traces and erase the refrace lines. This signal is guided to the Z-axis amplifier, amplified, and applied to the CRT.
- Gate pulse signal

  +GATE that is positive during saw-tooth wave rising is generated, amplified and guided to the A GATE OUT terminal. Is is also guided to the waveform storing trigger generator and equivalent-sampling sawtooth-wave generator circuits.

When the sweep mode is set to AUTO and the trigger pulse signal is not applied to the sawtooth-wave generator, or the trigger level exceeding the trigger range is set, the self-sweep occurs automatically. When the trigger pulse signal is applied, the trigger state appears.

When the sweep mode is set to NORM and the trigger pulse signal is not applied to the sawtooth-wave generator or the trigger level exceeding the trigger range is set, the sweep stops. When the trigger pulse signal is applied, the trigger state appears.

When the sweep mode is set to SINGLE/RESET, the sweep stops (and waits for trigger pulse signal). When the trigger pulse signal is applied, sweep occurs once. Thereafter, a single sweep takes place where the sweep is not caused by applying trigger pulse signal. While waiting for the trigger pulse signal, LED or READY is lit.

Sweep generator

The TIME/DIV determine the sweep speed. It is selected by A TIME/DIV. The sawtooth-wave generator consists of the capacitor and the resistor of the TIME/DIV .

When the disconnect amplifier of IC1612 is turned off, the timing capacitor is charged by the of the constant current circuits of IC1706. The capacitor terminal voltage is applied to the sweep control circuit via the FET buffer amplifier of IC1612 and the hold-off generator.

When the saw-tooth wave level reaches the given output value, the sweep control circuit turns the disconnect amplifier ON. This is the state to stop sweep. This causes the timing capacitor to discharge, and the saw-tooth wave level returns to the start level.

With the sweep start comparators of IC1612, the output from the buffer amplifiers of IC1612 is feed back to the disconnect amplifier so that the capacitor is discharged to a given level (start level) and kept at this level. In this manner, to end the sweep and to start a new sweep, a given time is necessary. This time is given by the hold-off generator. After a given time has elapsed, the output from the hold-off generator causes the sweep control circuit to wait for the trigger pulse signal.

The jitter free circuit receives the output indicating that the sweep control circuit is waiting for, and guides the jitter-free sweep start signal to the sweep control circuit. When the sweep control circuit receives this sweep start signal, it turns the disconnect amplifier off. This starts the next sweep.

The sweep control circuit also outputs unblanking signal, which is guided to the Z-axis amplifier through the horizontal axis control circuit.

Gate out

The gate-out signal is branched from the output of the sweep control circuit, guided to analog switch IC2401, then guided to the A GATE OUT terminal.

The output from the sweep generator is guided to the horizontal-axis amplifier through the horizontal axis control circuit.

Hold off generator

The hold-off generator C1613, Q1603, IC1611, R1637, IC1608, IC1703, C1707, C1708, C1707, C1710, C1711 and C1712 receives the saw-tooth wave signal started before, and generate hold-off signal (sweep inhibit signal), and guide it to the sweep control circuit.

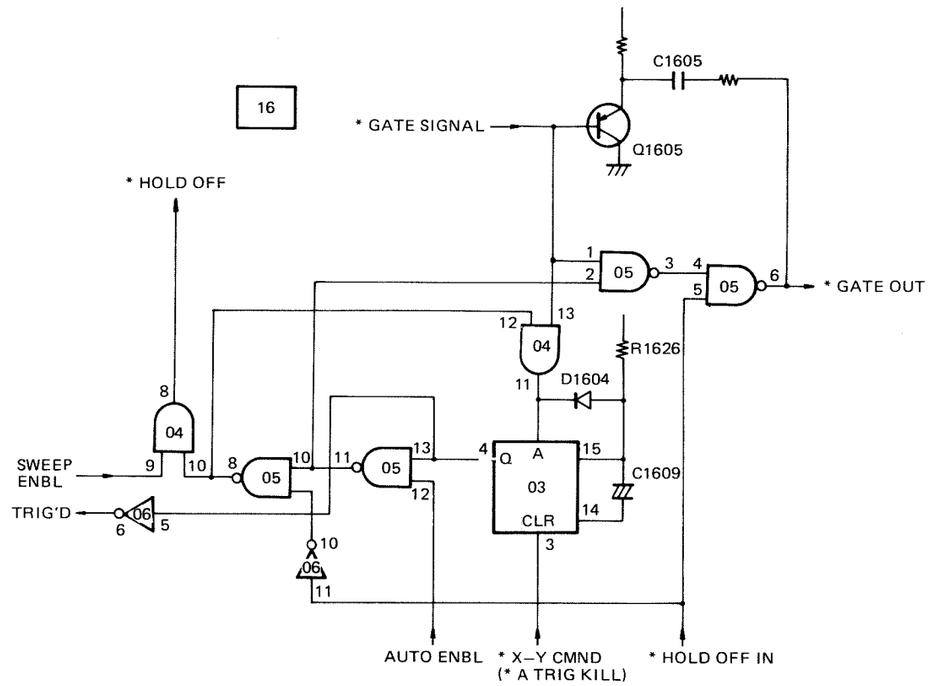
The length of hold-off signal is determined by the capacitor and IC1611 of the hold-off circuit.

The length of hold-off signal can be varied in a range about 1 : 4 to 5 by change IC1611 output voltage.

Single sweep control

At single sweep, SWEEP ENABLE signals is output from the single sweep control circuits IC1604 and IC1608 according to the RESET signal.

Figure 2-4-1-5. A Sweep Control Circuit



2-4-2 B-sweep Generator 18

This sweep generator is as shown in Figure 2-4-2-1. Here, the same circuits as in the case of A-sweep generator are not described and only the circuits specific to the B-sweep generator will be described.

The B-sweep generator operates when the HORIZ DISPLAY is set A INTEN, A INTEN & B (DLY'D). A given time after the A-sweep generator starts sweep (delay time), the B-sweep generator starts sweep. The delay time is determined by the set values of TIME/DIV and DELAY TIME.

If the SOURCE set to the TRIGGERED DELAY (CH 1, CH 2, EXT), then after the delay time, the delay pickoff pulse signal is applied to the sweep control circuit and B-sweep is started by the trigger pulse signal. If it is set to CONTINUOUS DELAY (RUN AFTER DELAY), then after the delay time, the delay pickoff pulse signal is applied to the sweep control circuit, then immediately B-sweep starts.

The B-sweep generator, by these operation, generates the following signal.

- Sawtooth-wave

  This is guided to the horizontal amplifier and amplified, then applied to the horizontal deflection plate of CRT. It is also guided to the equivalent-sampling sawtooth-wave generator.
- Unblanking signal

  This brightens the traces and puts out the retrace traces. This signal is guided to the Z-axis amplifier and amplified, then applied to the CRT.
- Gate pulse signal

  +GATE that is positive during sawtooth-wave rising is generated, amplified and guided to the A•B GATE generator circuit for storage mode and sawtooth generator circuit.

The B-sweep generator operates nearly the same as in the case of the A-sweep generator stated before. Thus, the circuits specific to the B-sweep generator are the delay pickoff comparator circuit and the sweep control circuit.

The delay pickoff comparator circuits IC1804, IC1805, Q1805 and Q1806 have the following functions:

- At a given time after the start of A-sweep (delay time), the delay pickoff pulse signal is guided to the sweep control circuit.
- If A-sweep ends during B-sweep, the B-sweep is ended. However, this is not applicable in the equivalent-sampling mode.

Thus, the saw-tooth wave signal of A-sweep is guided via IC1804 to IC1805. The TIME/DIV is used to determine the voltage (comparison voltage) defining the delay time after the start of A-sweep. When the sawtooth wave of A has reached the set voltage, the delay pickoff pulse signal is generated, applied to the sweep control circuit, and B-sweep is started.

When HORIZ DISPLAY is set to A, the B-sweep generator does not perform sweep.

The sweep control circuits IC1802 and IC1803 output the gate signal according to the setting of RUN AFT D'LY an TRIGGERED DELAY (CH 1, CH 2, EXT) of B-source. This gate signal is guided to the sweep generator and the B-GATE OUT terminal.

The A of IC1802, by means of SWEEP ENABLE signal from the delay pickoff comparator, sets the B of IC1802 to the state of waiting the trigger pulse signal, and applies the gate signal to he A of IC1803. At *B TRIG KILL Lo, the pin 7 of IC1802 is prohibited to make sweep even if SWEEP ENABLE signal is applied to A of IC1802.

When the B of IC1802 is RUN AFTER DELAY, the state is (see Figure 2-4-2-3): *RUN AFTER DELAY: Lo

If the trigger pulse is input, TRIG'D DELAY signal (pin 15) of IC1802 is not output.

When the B of IC1802 is TRIGGERED DELAY, the state is: *RUN AFTER DELAY: Hi

According to the input of the trigger pulse, TRIGGERED GATE signal is output.

When the A and B of IC1803 are RUN AFTER DELAY, the state is (see Figure 2-4-2-3): *RUN AFTER DELAY: Lo

The pin 4 of IC1803 A enable level (nearly equal to the pin 11 of Vss IC1803.

The pin 2 of IC1803 A gate signal is output.

When the A and B of IC1803 are TRIGGERED DELAY, the state is:

*RUN AFTER DELAY: Hi
The pin 4 of IC1803 A: Hi
The pin 2 of IC1803 A: Lo
The pin 14 of IC1803 B: TRIGGERED GATE signal is output.

The A of IC1802 is reset by SWEEP END signal, and the gate signal is closed.

In the equivalent-sampling mode, the SWEEP END is invalidated by Q1809 and D1804.

Figure 2-4-2-1. Block Diagram of B-sweep Generator

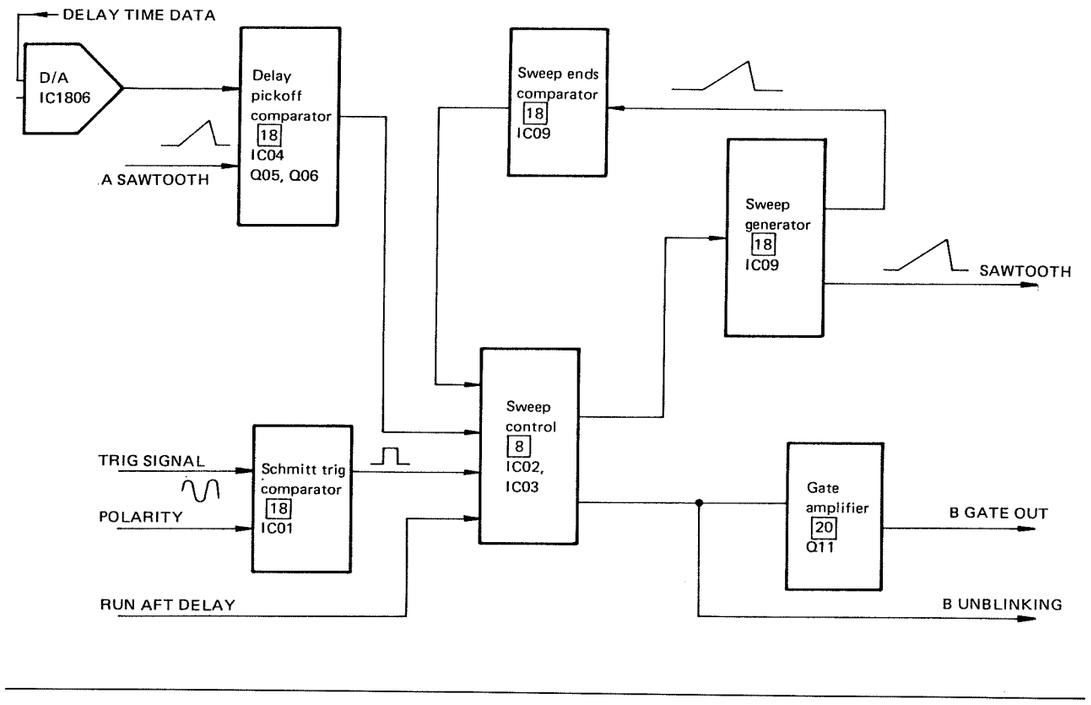


Figure 2-4-2-2. B-sweep Control Circuit

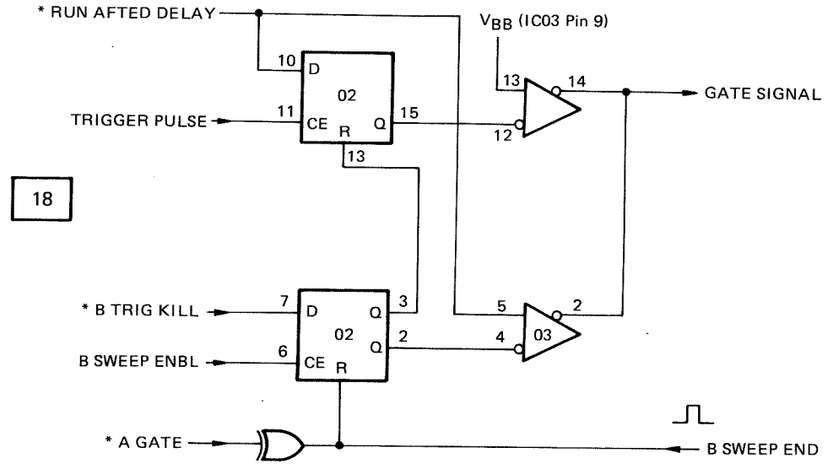
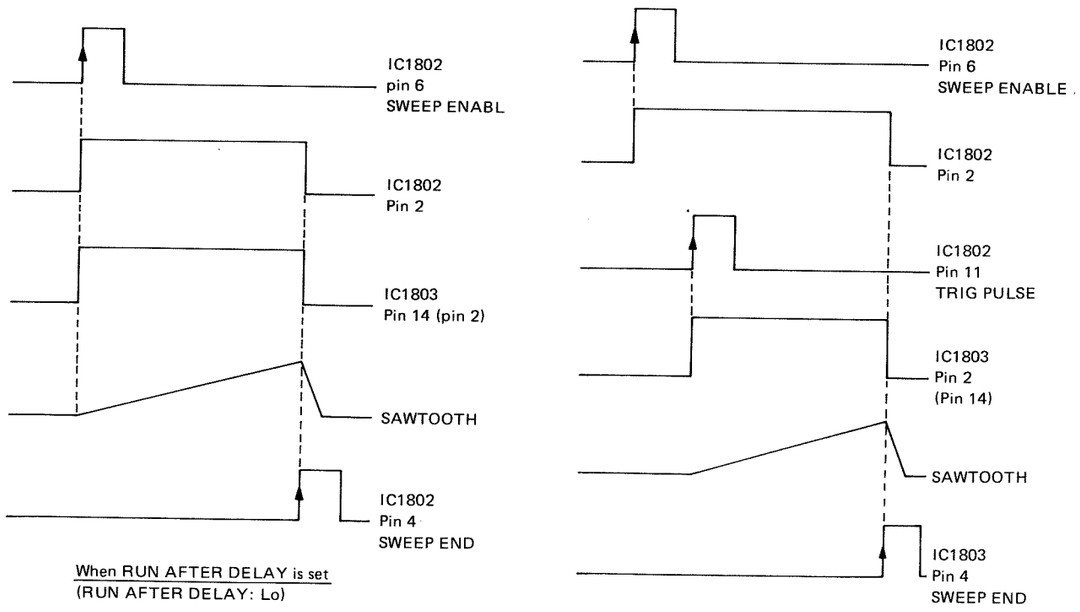


Figure 2-4-2-3. Timing Chart



2-4-3 Horizontal Amplifier 20, 22

The horizontal-axis amplifier is as shown in Figure 2-4-3. This amplifier amplifies one of the following signals to a sufficient amplitude to deflect CRT electron beam in horizontal direction.

- A- or B-sweep sawtooth-wave signal
- In X-Y scope operation, the signal applied to the input of CH 1
- X-axis character signal
- X-axis storage signal

The input-common emitter amplifiers Q2004 and Q2005 circuits are used to pick of the amplified output signal and to guide it to the negative feedback circuit that returns the signal to the base. The negative feedback is used to improve and stabilize the frequency a characteristics.

The input signal to these circuits is converted to a current and applied to the base of Q2004. This changes the currents passing through the feedback resistors R2034 and R2039 and the changed current is output as the voltage amplitude.

The [POSITION ◁ ▷] and [FINE ◁ ▷] are set by D/A CONVERTER IC2005 and to change the input current of the base of Q2005 and to adjust the horizontal position of electron beam on CRT.

The gain setting and limiting amplifiers Q2202 and Q2203 have the following functions:

- By means of the differential amplifier consisting of Q2202 and Q2203, the signal applied to the base of Q2202 is output as two signals having opposite poralities from the collectors of Q2202 and Q2203.
- In [X 10 MAG] the gain is selected by the emitter resistors of Q2202 and Q2203 that are switched by the reed relay RL2201.
- The constant current circuit consisting of Q2204, and the load resistances of R2267 and R2268 of Q2202 and Q2203 are used to limit the amplitude, so that the last-stage amplifier is not saturated when the [X 10 MAG] is set to ON.

  And the above function also includes that, when BEAM FIND is set, the current of the constant current circuit formed by Q2204 is reduced so that electron beam is guided on the screen.

By means of the voltage-to-current converter Q2207 and Q2208, the signal voltage applied to the base of the transistor is converted to the current and guided to the output amplifiers.

The output amplifiers Q2209, Q2210, Q2211, Q2212, Q2213, Q2214, Q2215, and Q2230 are used to amplify the signal applied from the former stage to a sufficient amplitude to deflect CRT electron beam in the horizontal direction.

Thus, the signal amplified by Q2209, Q2210, Q2212 and Q2213 is guided to the right-side deflection plate; the signal amplified by Q2211, Q2214, Q2215 and Q2230 is guided to the left-side deflection plate.

The Q2209, Q2210, Q2211 and Q2230 are the emitter ollowers that operate as the buffers. They drive the output transistors with low impedance. Particularly when Q2212 output voltage rises at a high-speed sweep, the Q2209 drives to speed up the rising of output signal.

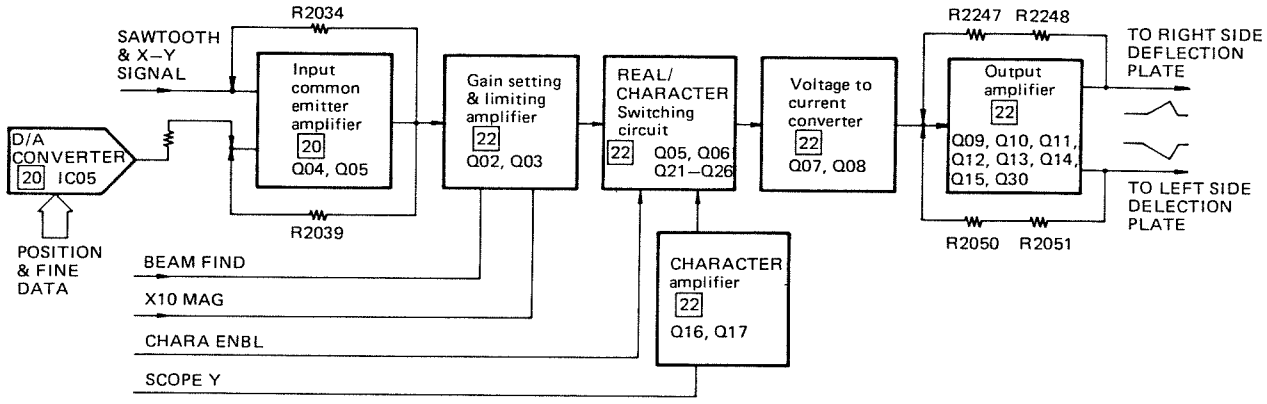
The R2247, R2248, R2250 and R2251 are feedback resistors. They lower the output impedance and improve the frequency characteristics and stability.

Q2216, Q2217, Q2223 and Q2224 form a character-signal amplifier circuit, which switches between the sweep waveform signal and character signal in order to switch the bias voltages of Q2205, Q2206, Q2221 and Q2222.

2-4-4 External Signal Output 24

For external signal output, same terminals are used for CH 1 OUT and PEN Y, A GATE and PEN X, B GATE and PEN UP, and Z AXIS and EXT CLOCK respectively. The terminal functions are switched by REAL SIGNALS - STORAGE SIGNALS switch S2401 on the rear panel. The output signal switching between CH 1 OUT and PEN Y is performed by relay RL2401, that between A GATE and PEN X by analog switch IC2401, and that between B GATE and PEN UP is also performed by IC2401. The input signal switching between Z AXIS and EXT CLOCK is performed by FET switched Q2401 and Q2402.

Figure 2-4-3. Block Diagram of Horizontal-axis Amplifier



2-5 Z-AXIS AND CRT CIRCUIT

2-5-1 Z-axis Amplifier, Enhance and Auto Focus 25, 26, 27, 28

The Z-axis amplifier is as shown in Figure 3-5-1 and has the following functions:

- Amplifies unblanking signal that brightens trace lines and blank out the retrace lines during A, B sweep or storage sweep.
- Amplifies chop blanking signal that erases transient phenomena appearing when the vertical mode is set to CHOP.
- Amplifies external intensity modulation signal applied to the Z-axis output terminal.
- Adjust the brightness by means of A INTEN and CHARACT INTEN.
- By means of ENHANCE, the brightness if further increased when A-sweep time is in a range of 1 ms/div to 2 ns/div.
- Performs AUTO FOCUS function to adjust the focus voltage in association with INTEN operation.

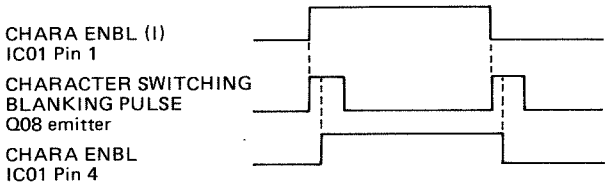
The blanking signal is guided to the emitter of Q2503. The Q2503 is a base-ground amplifier having a low input impedance. The output signal of Q2503 is amplified by the feedback amplifier consisting of Q2513, Q2514, Q2515 and Q2516 and feedback resistors R2552, R2253, R2556 and R2555. The D2502 are to prevent Q2516 from saturation.

The signal applied from the Z-axis input is converted by R2502 to a current. This current is used to change the output level of the above to the feedback amplifier and thus change the intensity of CRT.

The enhance circuit consists of IC2801, IC2802 and IC2803. By pushing ENHANCE switch, ENHANCE ENABLE signal is output from the collector of Q2501 and guided to the CRT circuit via the feedback amplifier.

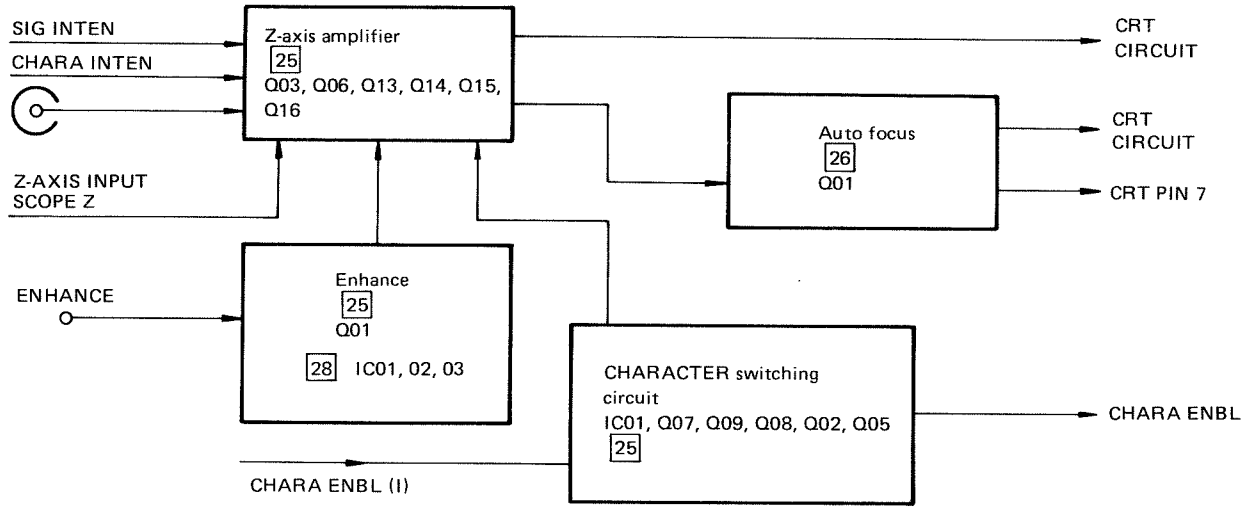
Character switching blanking pulse and CHARA ENBL signal are generated by IC2501 using the CHARA ENBL (I) signal. The CHARA ENBL signal is supplied to the X and Y axes, and to the X-axis and Y-axis main amplifiers as the character switching signals.

CHARA ENBL (I)	IC01 Pin 1
CHARACTER SWITCHING BLANKING PULSE	Q08 emitter
CHARA ENBL	IC01 Pin 4



The auto focus circuit Q2601 converts the voltage set by R2602 AUTO FOCUS to a current. The current is amplified with feedback amplifier of Q2605 and guided to the pin-7 focus electrode of CRT. The current is partly applied to Q2752 and Q2753 and guided to the pin-5 and pin-11 focus electrodes of CRT so that the best focus condition is maintained independent of INTEN if changed.

Figure 2-5-1. Z-axis Amplifier, Enhance and Auto Focus



2-5-2 CRT Circuit 26, 27

The CRT circuit, by applying high-voltage bias to each electrode, generates high-voltage supply to enable electron beam to draw high-speed, clear raster on the screen. It also guides the intensity modulation signal and unblanking signal to the CRT.

The CRT circuit is shown in Figure 2-5-2. The CRT circuit consists of the DC-DC converter circuit to supply the bias voltages of from about +17.55 kV to about -2.45 kV, and the limiter circuit to automatically lower the high-voltages if it becomes too high.

High voltage oscillator

The high-voltage oscillator circuit consist of Q2701, D1750, C2750, R2752 and the primary winding of T2750. The Q2701 is the oscillation transformer to which the positive feedback is applied from the collector winding of T2750 through the base winding, so that the Q2701 makes repeated oscillation of about 30 kHz and generates high-voltage at the secondary winding. The C2610 and R2632 supply the base current of Q2701. The C2611, Q2604 and Q2603 circuits operate at the start of oscillation, and is turned off during oscillation. The D2750 and R2752 are the protection circuit to preven the voltage from exceeding the withstand reverse voltage between the base and emitter of Q2701.

High voltage regulator

The high voltage regulator circuit IC2601 (1/2) makes such control that the high voltage generated by the high voltage oscillator is regulated, independent of variations in the brightness and the primary voltage, so that the CRT cathod voltage is -2.45 kV and CRT deflection factor is always kept constant. The regulator circuit consists of the error amplifier formed by IC2601 (1/2). R2629, R2630 and R2631 and the error deflection circuit of R2637, R2626, R2627, and R2608 having the reference voltage of +40 V. In this circuit IC2601 (1/2) functions to maintain the voltage across R2637 at -2.45 kV, and the output of IC2601 controls, via R2632, the base current of Q2701 and thus the oscillation intensity.

High voltage limiter

The high-voltage limiter circuit of IC2601 (1/2) and Q2602 functions as follows. If Q2701 oscillation amplitude rises abnormally by any reason, then the 3rd anode P3 of CRT may have high-voltage and X-rays may leak from CRT. Thus, if the CRT cathode voltage reaches -2.6 kV to -3.0 kV, the limiter circuit functions to make high-voltage oscillation intermittent. The high-voltage limiter circuit consists of the Schmidt trigger circuit of IC2601 (1/2), R2606, R2623, R2646, R2647 and R2648 the detection circuit of R2620, R2621 and R2622 and the control circuit of D2610, R2624 and R2625.

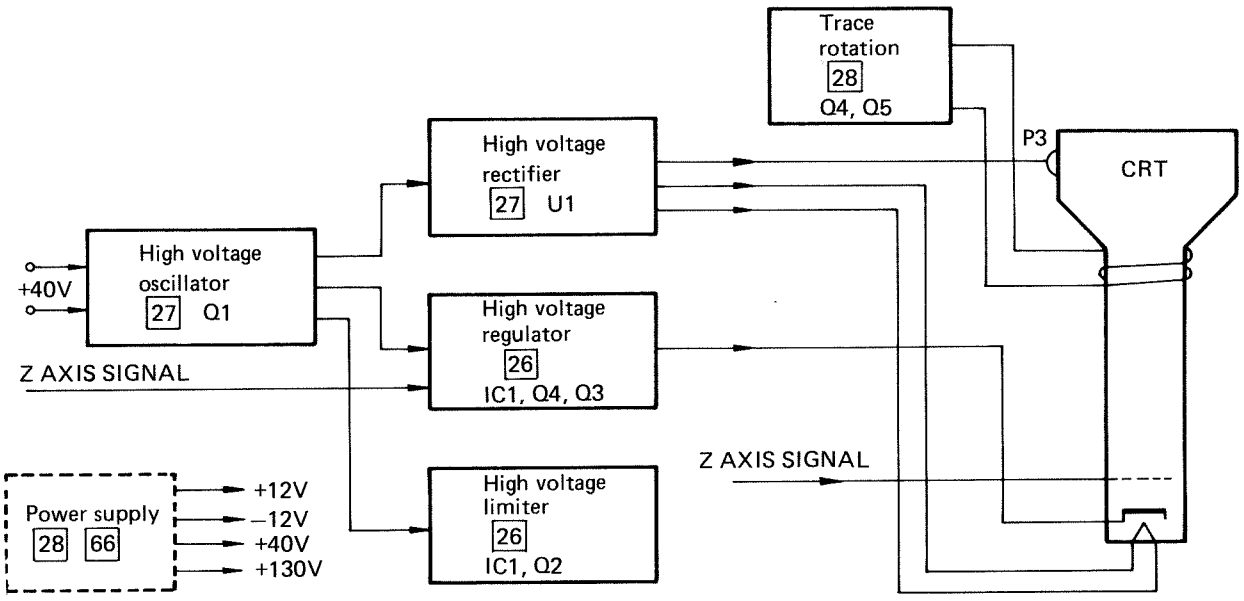
When the CRT cathode voltage exceeds -2.6 kV, the voltage at pin 6 of IC2601 (1/2) drops, the Schmidt trigger circuit inverts, and the voltage at pin 7 of IC2601 inverts. This makes Q2602 ON and draws the base current of Q2701 through D2610 and as a result, the oscillation stops and the CRT cathode voltage is controlled below -2.6 kV. When the oscillation has stopped, the voltage across the C2608 dischrages through R2621. This inverts the Schmidt circuit, and the high-voltage oscillation starts again. If, however, the CRT cathode voltage exceeds -2.6 kV again, the above-mentioned operation repeats itself, and thus makes the high-voltage oscillation intermittent. As a result, the CRT screen brightens intermittently.

High voltage rectifier

The high-voltage rectifier includes the 6-times specification circuit that supplies +17.55 kV to the 3rd anode P-3 of CRT, the half-wave rectification circuit that supplies cathode voltage and 1st grid voltage, the focus electrode circuit of pin 5, and the ASTIG electrode circuit of pin 11.

The trace rotation consists of Q2804, Q2805, R2829, R2830 and L2701. The rotation coil is intalled on the CRT neck, current passes through the coil, and the generated magnetic flux changes the angle of CRT electron beam. The current is controlled by the trace rotation Q2805. The Q2804 and Q2805 convert the current passing through Q2829 to a small current.

Figure 2-5-2. Block Diagram of CRT Circuit



2-6 POWER SUPPLY AND CALIBRATOR

2-6-1 Power Supply 28, 66

The power supply for DS-6121/DS-6121A supplies 7 stabilized outputs of +130 V, +40 V, ±12 V, -5 V, +5 V (1) and +5 V (2) and 2 non-stabilized outputs of +47 V and -7 V to a load.

The stabilized output supplies an output of low-ripple noises, which is not affected by an input fluctuation or load fluctuation.

The stabilized output is helped endure load short-circuit for about 1 minute by an overcurrent protective circuit.

A supply voltage allowable range is from 90 V to 250 V (48 Hz to 440 Hz).

Power consumption is 145 W.

The power supply consists of a line noise filter board, switching regulator board and series regulator board.

The line noise filter board eliminates noises caused by the switching regulator.

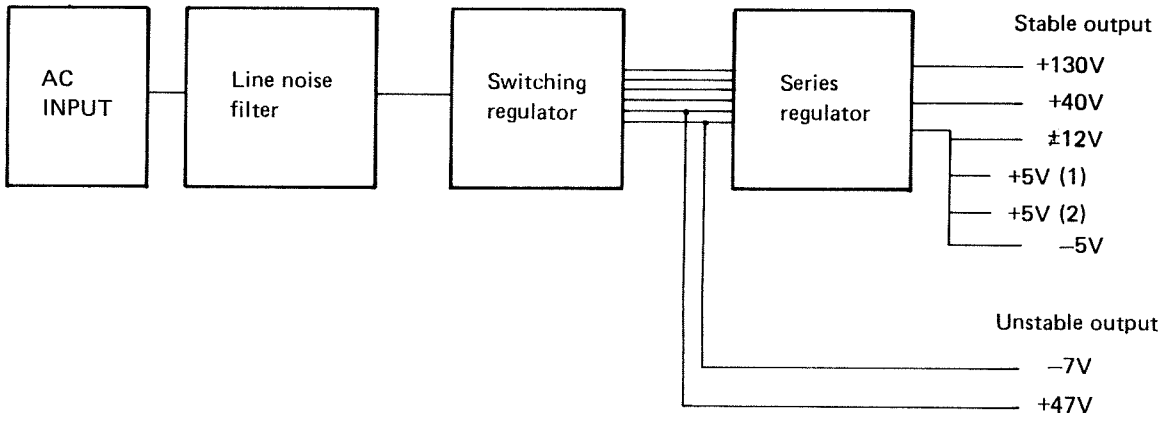
The switching regulator board produces a DC non-stabilized output from a commercial voltage by AC-DC-AC-DC conversion.

The series regulator board stabilized the DC non-stabilized output produced by the switching regulator board.

2-6-2 Calibrator 28

The calibrator extracts 1 kHz from the time base of the CPU circuit, shapes the waveform by Q2802 and Q2801, and outputs it to the voltage CAL terminal on the front panel via R2808. The current CAL wave is output from the rear panel after voltage-current conversion using R2809 and R2846.

Figure 2-6-1. A Power Supply



2-7 A/D CONVERTER 40

Figure 2-7-1 shows the A/D converter's block diagram and Figure 2-7-2 shows the sample & hold circuit diagram.

The A/D conversion clock includes the CH 1 clock and CH 2 clock which are supplied from CPU CIRCUIT 52 , and the clock which is generated inside the A/D converter during equivalent sampling. Once of these clocks is selected by IC1 (10H158). For CH 1, the IC1 output is input to the current switch of Q201 to Q204 by the inverted output of IC3 (10H116). One of the complementary outputs is delayed and a 4 ns positive pulse is obtained by the OR gate consisting of Q205 to Q208. The output pulse is amplified by Q209 to Q211 and used to drive sampling diode gate D102 to D105 via pulse transformer T201 and bounce-unbounce transformer T202. On the other hand, the 20 ns clock pulse for A/D converter IC101 (CX20052A) is generated by IC2 (10H131) and 20 ns delay line DL2. The configuration for CH 2 is similar to CH 1.

The signals input to the A/D converter are CH 1 A/D and CH 2 A/D signals from the signal switch for A/D converter 12 and the sampling signal from the vertical main amplifier 10 . The sampling signal is selected by Q601 to Q604 SD215 on the A/D SW board during equivalent sampling. The signal input to the sampling diode gate is supplied, with CH 1, via the feedback amplifier consisting of Q101 to Q104 and the emitter-follower consisting of Q105 and Q106. The sampling output is input to source follower consisting of Q107 and Q108, amplified by feedback amplifier Q109 to Q113, and input to IC101. The configuration for CH 2 is similar to CH 1.

The output from A/D IC101 is ECL-TTL converted and latched by IC104 (74ALS374).

Figure 2-7-3 shows the sampling clock generator circuit. The equivalent-sampling clock is the comparator IC503 output signal which is obtained by comparison between the A/B sawtooth wave supplied from SAWTOOTH OUT (SA) 23 and the output from counters of IC504 to IC506 and D/A converter IC501 μPC648. The output is supplied to CPU CIRCUIT 52 for use as the *EQU SMPL clock.

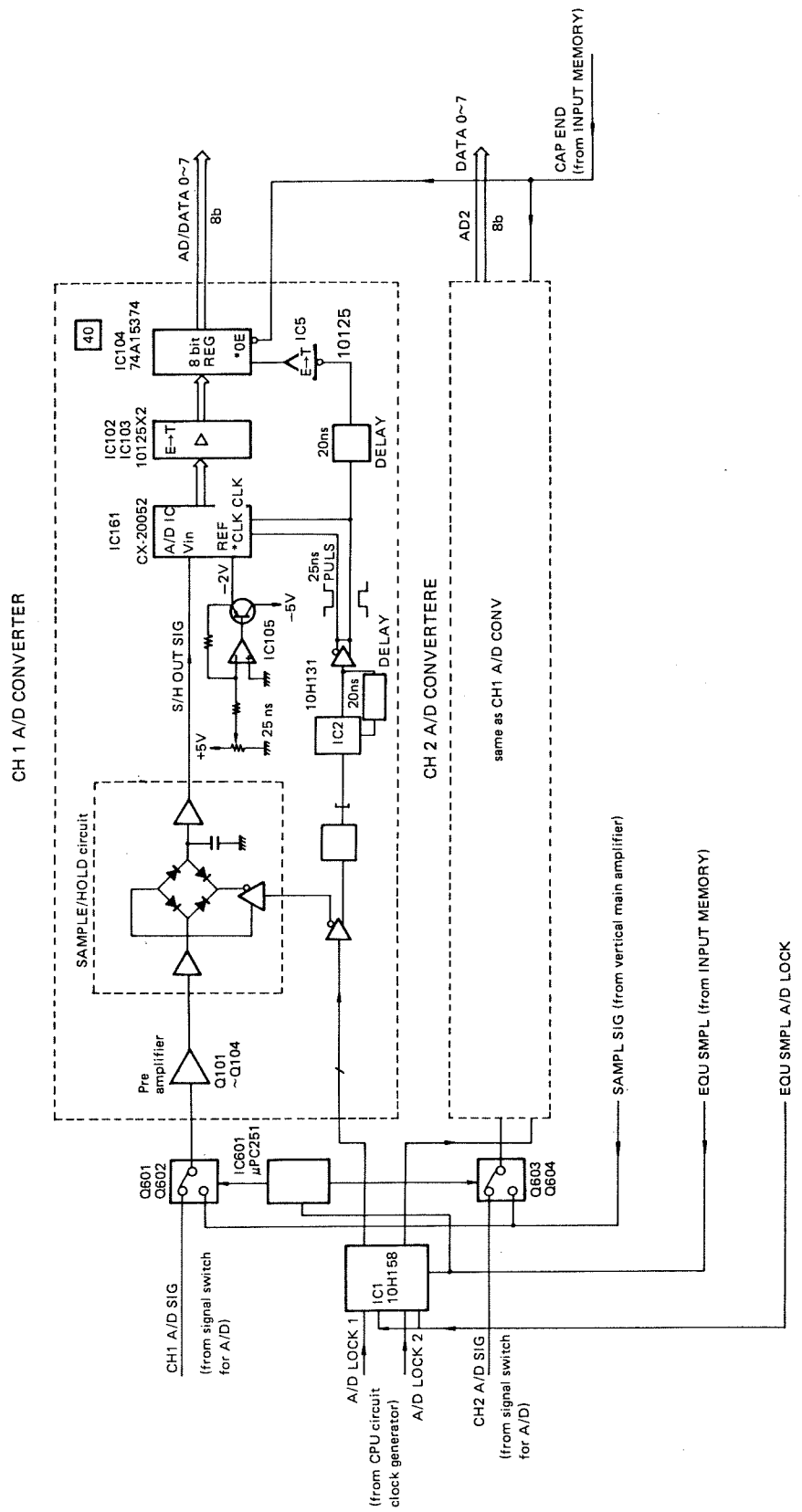


Figure 2-7-1. Block Diagram of A/D Converter

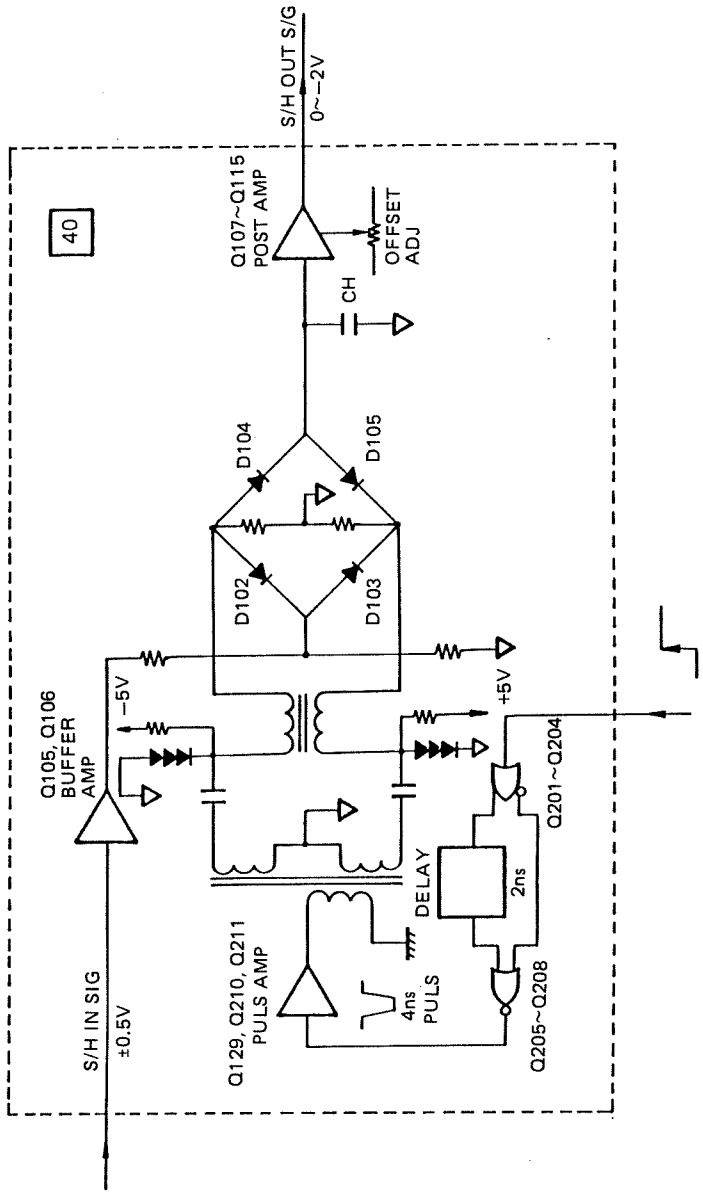


Figure 2-7-2. Sample Hold Circuit

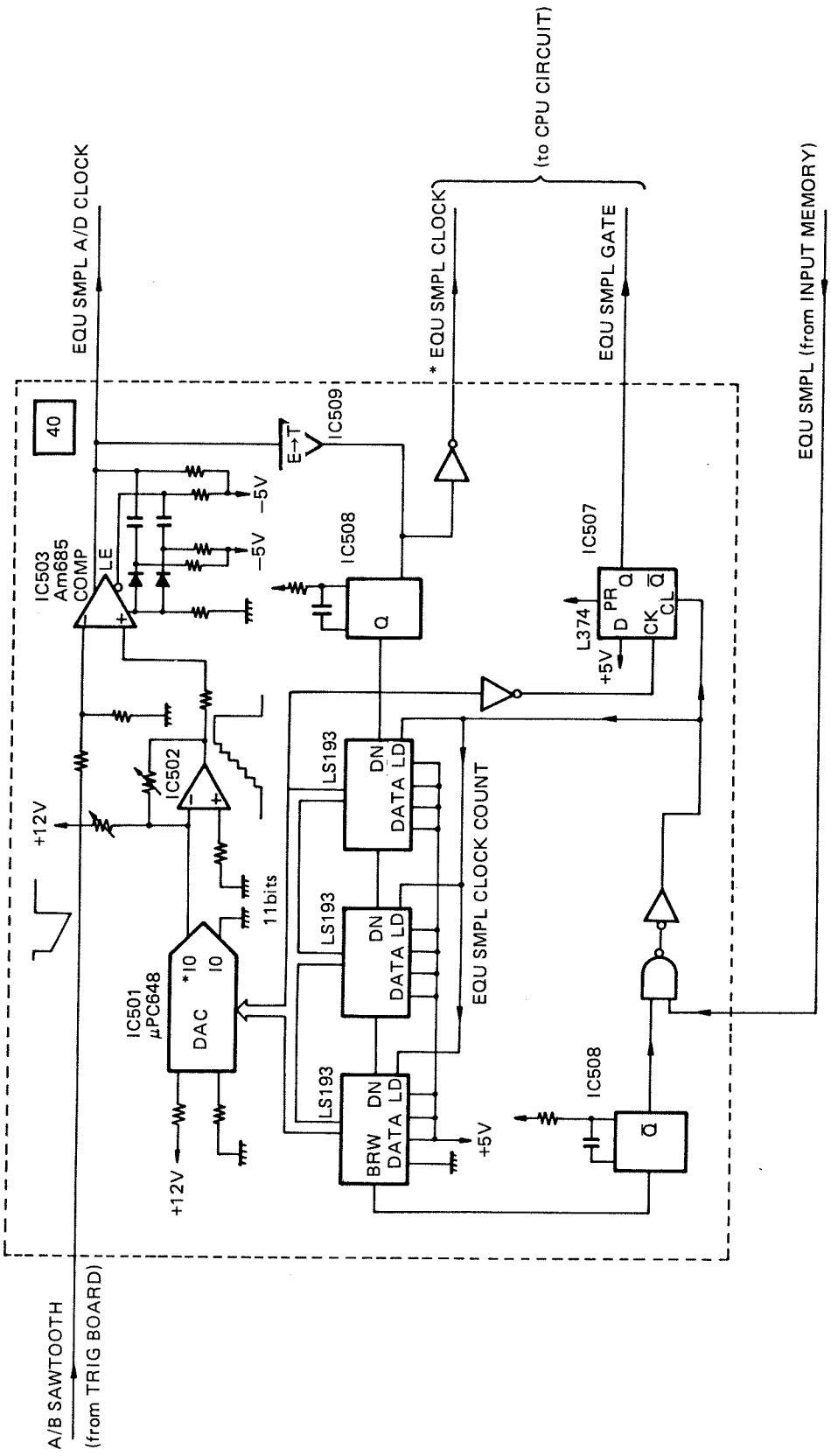


Figure 2-7-3. EQU SAMPL Clock Generator

2-8 INPUT MEMORY AND CPU CIRCUIT

2-8-1 Capture Memory and Its Control Circuit [50], [52]

The capture memory consists of the high-speed RAM mounted on the INPUT MEMORY PCB.

The A/D converter output data for CH 1 is input to high-speed RAM μPD2149D (4 × 1 K) IC3J, 3H, 3K and 3G and the data for CH 2 is input to IC3C, 3D, 3B and 3E. The memory length is 8-bit × 2 K-word for each channel.

The capture memory addresses are generated by memory counters IC2G, 2H and 2J for CH 1 and by IC2C, 2D and 2E (74ALS561) for CH 2. The counter clock is supplied from the CLOCK GENERATOR of CPU CIRCUIT 52 . The same clock is also used to generate a 30 ns memory write enable signal with the IC1F (74F74F), IC1G and 1E.

When the write operation has finished, the memory address is latched by IC4D (74HC244) and output to the CPU data line.

The delay counters which determine the data position are the delay counter which consists of IC2K (74HC161), IC2M and 2L (75F161) and that in IC4N (74F161). The former delay counter counts pulses until the trigger is generated and the latter delay counter counts the momory length.

2-8-2 Operation Mode Control [50], [51]

Operations and modes are set by the CPU data latching of register IC4H (74HC374) on the INPUT MEMORY PCB. The register output consists of the STORAGE/ROLL, EQU SMPL, ROLL BI-PHASE, CHOP MODE, FREEZE and ENVELOPE signal lines.

The STORAGE/ROLL signal line is output to CPU CIRCUIT [52] , DISPLAY MEMORY [57] and CHARACTER CIRCUIT [58] , [59] , and the level turns high when the storage or roll mode starts.

The EQU SMPL signal line is output to A/D CONVERTER [40] and is used to put the A/D converter into the equivalent-sampling mode. The level turns high in the equivalent-sampling mode.

The ROLL signal line is output to CPU CIRCUIT [53] , and the level turns high in the roll mode.

The BI-PHASE signal line is output to CPU CIRCUIT 52 to switch the clock generator output, and the level turns high when operating 40 MHz sampling.

The CHOP MODE signal line is output to CPU CIRCUIT [52] to enable the 1 MHz CHOP signal output from the clock generator. The level turns high in the real-time CHOP mode and it is low in other modes so as to inhibit the 1 MHz CHOP signal output.

The ENVELOPE signal line is output to ENVELOPE [41] , and the level turns high in the envelope mode.

EQU SMPL, ROLL, BI-PHASE and FREEZE are used for the control inside INPUT MEMORY [50] , [51] .

In addition there is another mode setting register in DISPLAY MEMORY [56] . It is used to set the display modes. (Refer to the item describing "Display Memory and Its Control Circuit".)

2-8-3 Clock Generator 52

Figure 2-8-3-1 shows the clock generator block diagram and Figure 2-8-3-2 shows the dividers and electors of the clock generator.

The 40 MHz reference clock is generated by X'tal oscillator X5200. The 40 MHz clock is divided into 1/10 by counter IC3G (74S196) to become a 4 MHz clock, which is supplied to CPU (CI6J) for use as the CPU clock.

The 4 MHz clock is also divided by counters IC8J, IC8H and IC8G (74HC390) into 2 MHz, 400 kHz, 40 kHz, 400 Hz and 40 Hz. The 2 MHz clock is divided by IC10J (74HC393) into 1 MHz for use as the 1 MHz CHOP signal. The 4 kHz clock is also divided by IC10J (74HC393) into 1 kHz, which is supplied to the 1 kHz CAL signal output circuit. The 4 MHz, 400 kHz, 40 kHz, 4 kHz, 400 Hz, 40 Hz and 40 MHz clocks, the 20 MHz clock divided by IC2F (10H131), and the equivalent-sampling clock *EQU SMPL CLOCK from A/D CONVERTER 40 are selected by IC9J (74HC151). The output is then divided into 1/2 and 1/4 by IC10H (74HC74) and, with the clock before dividing and the external clock, selected by IC9G (74HC153).

The X5200 output level is converted by IC1F (10124) from TTL level to ECL level, which is input to IC3F. Then IC3F output level is converted by IC2G (10125) to TTL level, which is input to IC9J.

The clock selection is performed with data FREQ 0 to 4.

The IC9J output level is converted by IC1F from TTL level to ECL level, and input via IC1D (10H158) to the A/D converter as CH 1 CLOCK and CH 2 CLOCK. CH 1 CLOCK and CH 2 CLOCK are converted by IC2D from ECL levels to TTL levels, and supplied to INPUT MEMORY.

In the storage mode with ahigher sweep rate than 5 µs/div, the CH 1 and CH 2 A/D converters are supplied with two 20 MHz signals having opposite phases. In this case, the BI-PHASE signal line turns high, and the 20 MHz Q1 and $\overline{Q1}$ outputs obtained by dividing of IC2F are selected by selector IC1D (10H158) and output. When the CH 1 and CH 2 A/D converters are used, this allows a 40 MHz sampling rate.

Figure 2-8-3-1. Clock Generator

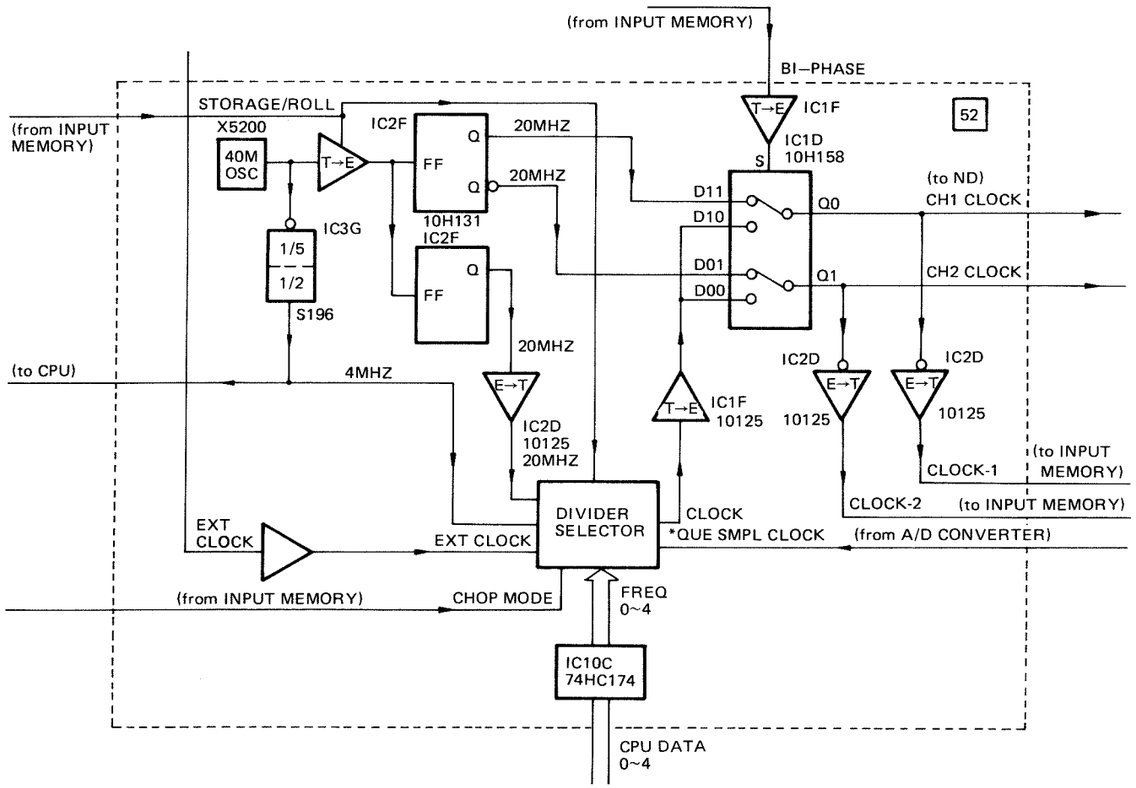
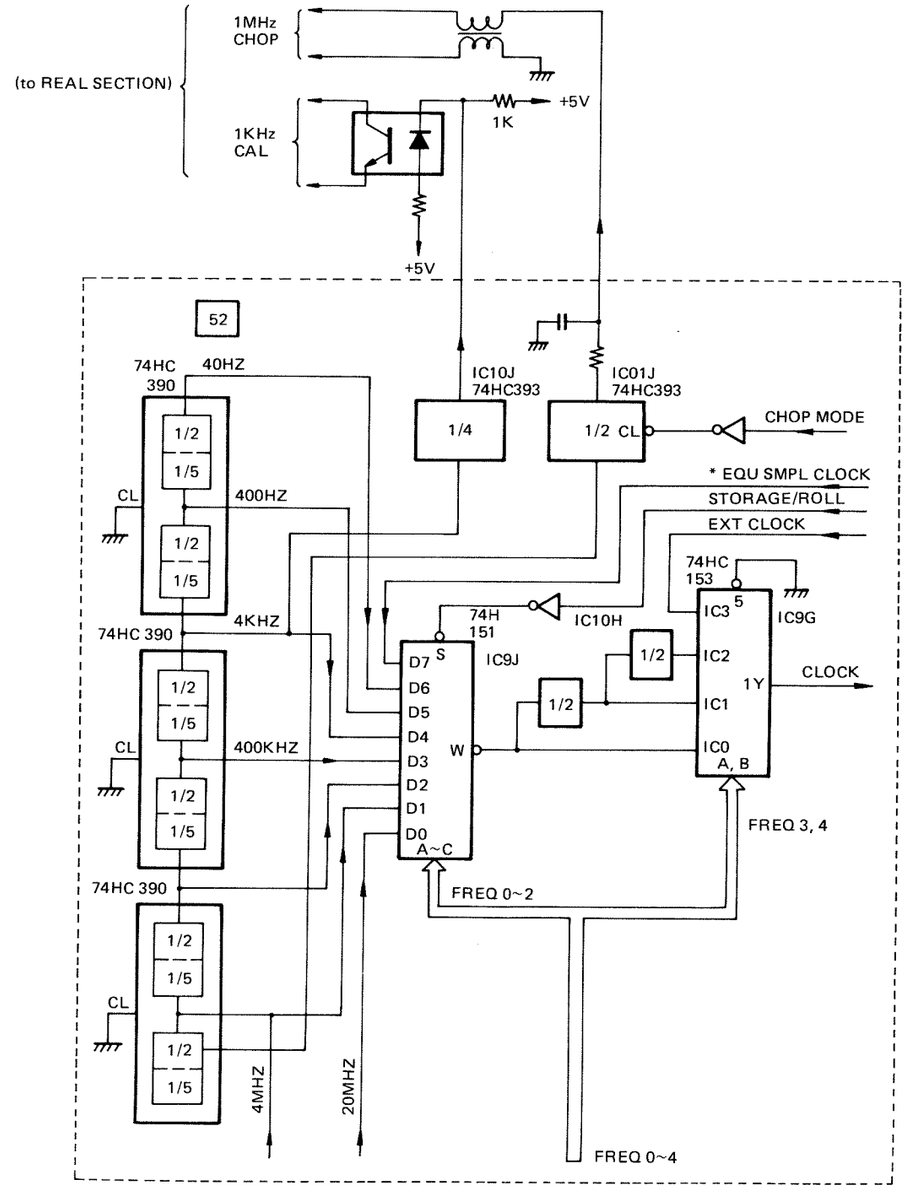


Figure 2-8-3-2. Divider & Selector



2-8-4 Keyboard and Interface 53, 62

The front panel keyboard and LED lamps are controlled by keyboard controller IC8C (μPD8279) on CPU CIRCUIT PCB 53 . The output signals of IC8C are OUT LED 0 to 7 and KSCAN 0 to 3 and LED BR, and the input signals are RTN 0 to 7.

The key-switch matrix of S6201 to S6277 is scanned by eight signal lines obtained by decoding KSCAN 0 to 7 by IC6200 (74HC138), and the key pressed is detected by signa lines RTN 0 to 7.

LEDs D6200 to D6274 light by dynamic lighting as follows:

The signal lines of OUT LED 0 to 7 are latched by registers IC6204 (74F174) and IC6205 to IC6207 (74LS374) with the signal lines obtained by decoding KSCAN 0 to 2 by IC6201 (74HC138). The output is connected via a resistor to the cathode of each LED.

The anodes of LEDs are driven by the outputs of shift register IC6202 (74HC164), the input of which is KSCAN 3 and the clock of which is LED BR.

Operation mode indicator LEDs D6290 to D6295 are lit by the signal lines from INPUT MEMORY 50 via IC6203.

2-8-5 CPU and Periphery Circuit 53

This block is mounted on the CPU CIRCUIT PCB 52 , and is composed of the CPU, CPU data buffer, CPU address buffer, interrupt circuit, battery backup circuit and CPU power-on reset circuit.

The CPU is IC6J (μPD780C-1, equivalent to Z-80A). CPU DATA 0 to 7 are input/output via the bidirectional buffer of IC7F (74HC245). CPU ADDRESS 0 to 15 are output via IC2G and IC6G (74HC244). Signal lines CPU DATA, ADDRESS DATA, *RD, *WR, *MREQ and *IOREQ are used to control the sections.

The 4 MHz CPU clock is supplied from CLOCK GENERATOR 52 .

Interrupt circuit IC6E is supplied with probe-sensor signal interrupt *INT PROB, external clock interrupt *INT EXCK, keyboard controller interrupt *INT KEY, waveform write and interrupt *INT IN, display memory interrupt *INT DISP and interrupts from interface *INT GPIB and *INT RS-232-C. The interrupt conditions are latched by register IC7E (74HC374) are read by the CPU through the CPU data bus.

The battery backup circuit consists of Ni-Cd battery BT5320 and Q5320. When power is turned off and the voltage drops below the sum of the +5 V battery (3.6 V) and Q5320's base-emitter voltage, Q5320 turns off and BT5320 supplies power for RAM IC3E to back up the memory of IC3E of CPU CIRCUIT MEMORY 54 . When power is on, BT5320 is charged by R5320.

The power-on reset circuit outputs a negative pulse when the +5 V supply voltage drops below 4.5 V due to ICC2G (TL7700) or when it rises above 4.5 V after turning power on. The approximate pulse width is 2 ms.

The pulse is supplied via Q5321, Q5322 and IC4J to the RESET terminal of keyboard controller IC8C, then to the RESET terminal of CPU IC6J via inverter IC7B.

2-8-6 CPU Circuit Memory 54

The memory is mounted on CPU CIRCUIT PCB and composed of ROMs in which software is stored and RAMs which store work area, waveform data, etc.

The ROMs are IC5C, IC5E and IC5F (27C256) (8-bit × 32 K), and the RAMs are IC3C, IC3F (6264) (8-bit × 8 K).

The memory selection is performed by IC5H (74HC154) decoding CPU ADDRESS 12 to 15. ROMs IC5C and IC5E perform bank switching using the IC8D output, which is the OR output obtained from the UC4H and IC10D's OR (negative-logic) output of IC5H's decoder output and from the output of flip-flop IC10B (74HC74).

For the battery backup of RAM IC3E, the power is supplied from 53 BT5320 during power is off. IC3C is used for the CPU work-area memory, IC3E is used for the waveform memory and setup memory as well as for a part of the CPU work-area memory, and IC3F is used for the buffer memory.

2-8-7 Interface to Real Mode [53], [54], [61]

Figure 2-8-7 shows the interface with the real-time section.

The setting data for relay switching and D/A converter, etc. are transferred as serial data from the real-time section. These consists of three sets of signal lines; LATCH (A), SHIFT (A) and DATA(A); LATCH (B), SHIFT (B) and DATA (B); and LATCH (C), SHIFT (C) and DATA (C).

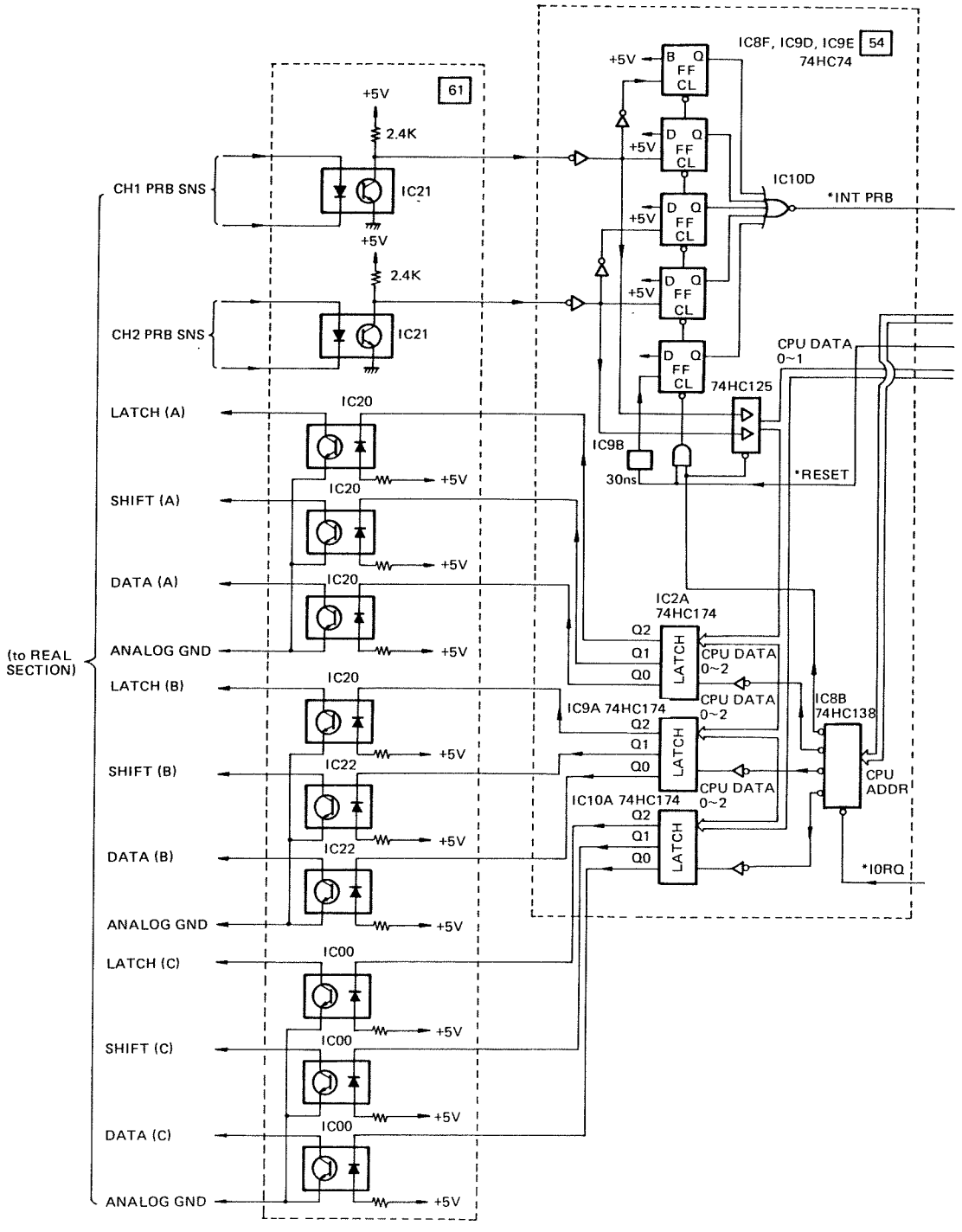
LATCH (A), SHIFT (A) and DATA (A) are used for vertical-axis setting, LATCH (B), SHIFT (B) and DATA (B) are used for horizontal-axis setting, and LATCH (C), SHIFT (C) and DATA (C) are used for main-amplifier setting.

DATA (A) and DATA (C) are 72-bit serial data and DATA (B) is a 64-bit serial data. These serial data are converted into parallel data by shift register (74HC595) in the real-time section.

SHIFT (A), SHIFT (B) and SHIFT (C) are shift clocks of shift register (74HC595), and LATCH (A), LATCH (B) and LATCH (C) are latch clocks of latch register (74HC595). These signals are output by latching CPU DATA 0 to 2 using registers IC8A, IC9A and IC10A (74HC174) on the CPU CIRCUIT PCB, and they are input to the shift register via photocouplers IC6100, IC6120 and IC6122 installed on the MOTHER BOARD for isolation between the real-time and digital storage sections.

To detect the use of 10 : 1 probe, IC8F, IC9D and IC9E (74HC74) generate interrupt signal *INT PRB, which is read by the interrupt circuit [53].

Figure 2-8-7. Interface to Real Mode



2-9 DISPLAY MEMORY 55, 56, 57

The display memory consists of trace 1 to 4 waveform memory and V and H cursor memory sections.

The waveform data to be displayed on the CRT are transferred from the buffer memory to the 8-bit × 2 K memory of IC3E (HM6116). The RAM selection is performed by *TRACE CS and *TRACE WF of the display control.

The cursor data to be displayed are transferred to IC3H (HM6116). The RAM selection is performed by *CUR CS and *CUR WE.

Waveform data are latched by IC2C and IC2D (74HC174) and transferred to Y D/A of the output circuit. When the waveform data is to be displayed, the data of address counters of IC6E, IC5E and IC6F (74HC161) are latched by IC1C and IC1D (74HC174) and transferred to X D/A of the output circuit.

The storage, real-time, roll or X-Y display mode is set by IC4H (74HC174) latching the CPU data.

The clock supplied to the counter is obtained by dividing the 4 MHz CPU clock into 1/10.

2-10 CHARACTER AND OUTPUT CIRCUITS 58, 59, 60

The character-generator ROM is IC3F (2764) (8-bit × 2 K). the X-axis character data has 3 bits and Y-axis character data has 4 bits. The column address and row address respectively are added in IC1M, IC2M, IC1L and IC2L (74HC283), and transferred to X D/A and Y D/A. The column address is generated by IC5M and IC4M (74HC193) and row address is generated by IC4L (74HC193).

The waveform/cursor D/A converter output and character D/A converter output are switched at the output circuit, using analog switch IC5848 for the X axis and analog switch IC5878 for the Y axis.

The X-axis waveform/cursor data is input to 10-bit D/A converter IC5840 (MC3410), current-voltage converted by OP amplifier IC5841, and supplied to the vector-interpolation circuit which consists of FET switches Q5841 and Q5842, OP amplifier IC5841 and IC5843, resistors R5848 and R5849, and capacitors C5844, C5845 and C5846, in order to connect dots before outputting the waveform.

Similarly, the Y-axis data is input to 10-bit D/A converter IC5870 (MC3410) and OP amplifier IC5871, and output via the vector interpolation circuit which consists of FET switches Q5871 and Q5872, OP amplifiers IC5871 and IC5873, resistors R5878 and R5879, and capacitors C5874, C5875 and C5876.

In the real-time mode, the cursor signals of the vector interpolation outputs are held by analog switch IC5845, C5849 and C5850 for the X axis, and by analog switch IC5875, C5879 and C5880 for the Y axis.

The X-axis character data is input to 8-bit D/A converter IC5851 (μPD624C), and the Y-axis character data is input to 8-bit D/A converter IC5878 (μPC624C). Their outputs are switches IC5848 and IC5849.

The X-Y recorder outputs are output via analog switches IC5848 and IC5849. In modes other than the X-Y recorder mode, the analog switches set the signal outputs to the GND level.

2-11 INTERFACES 63, 64, 65

The GP-IB or RS-232-C interface pack is connected to the CPU bus via the INTERFACE MOTHER BOARD.

The GP-IB pack consists of interface controller IC6400 (μPD7210), bus transceivers IC6402 (75160A) and IC6403 (74161A), and of address/delimiter switch reading IC6401 (74HC244).

When the GP-IB is selected by IOREQ and the decoded signals of CPU ADR A3 to A7, GP-IB outputs interrupt signal *INT-GPIB to the CPU.

The RS-232-C pack consists of interface controller IC6500 (MC68661PA), bus buffers IC6502 (75188P) and IC6503 (75189AN), and of switch reading IC6501 (74HC244), as well as the 4.9152 MHz oscillator used for baud rate reference clock generation. The RS-232-C is also selected by IOREQ and the decoded signals of CPU ADR A3 to A7. The output interrupt signal is *INT-RS232C.

Section 3 Maintenance

This section describes the maintenance procedures for keeping the DS-6121/DS-6121A in good condition over a long period of time. If it becomes necessary to check and replace the circuit parts, refer to the Circuit Arrangement Diagrams.

Apart from the instructions given in this section, the proper operation procedures described in the operating manuals must also be observed to assure long satisfactory operation.

3-1 PREVENTIVE MAINTENANCE

These are the preventive maintenance procedure for preventing troubles and keeping your oscilloscope clean and well for a long period of time.

3-1-1 Cleaning

The extent of dirt varies according to the ambient condition in which the instrument is used. The instrument should be cleaned as required. Dirt accumulated in the instrument causes overheating because it interrupts effective heat dissipation. It also damages the parts under high-humidity condition. A dirty switch contact or connector can cause faulty contact, and dirt accumulated on the inner circuit part can cause spark during the wet season.

Exterior

Loose dust on the outside of the instrument can be removed with a soft cloth or small soft-bristle brush. The brush is particularly useful for dislodging dirt on and around the controls and connectors. Dirt that remains can be removed with a soft cloth dampened in a mild detergent-and-water solution. Do not use abrasive cleaners.

Interior

The best way of cleaning the dirt accumulated in the instrument is to use an air compressor. Dirt which remains after blowing with air compressor can be removed by using a soft paint brush and blowing again with air compressor.

CRT and Filter

The CRT screen and the filter can become dirty if they are used for a long time. Ordinary stains and fingerprints can be removed by wiping with a soft cloth. If they are terribly dirty, use a soft cloth dampened with alcohol.

3-1-2 If Unused for a Long Time

If you don't use the instrument for a long time, remove the probe, adaptor, etc. From it and put them in the supplied bag. Attach the supplied panel cover to it, put the dust cover on the oscilloscope, and store it in a place as dry as possible.

This can keep the instrument clean.

3-1-3 Checking

Inspect the inside of the instrument periodically for burnt resistors, faulty contacts, or damaged printed circuit boards. Major troubles can be prevented by repairing them immediately.

3-1-4 Periodic Adjustment

Periodic inspection and adjustments are necessary for keeping the instrument in accurate operating condition at all times. If the instrument is continuously used, inspect and adjust it about every 1000 hours. If it is not used so much, it may be inspected and adjusted about every six months.

3-1-5 Maintenance Aids

The maintenance aids listed in Table 3-1-5 include items required for performing most of the maintenance procedures in the instrument.

Table 3-1-5. Maintenance

Description	Specification	Usage
Soldering iron	15 to 40 W	General soldering and unsoldering.
Nutdrivers	2.6 mm, 3 mm, 4 mm, 5 mm	Assembly and disassembly.
Adjustable angle wrenches	4 inches	Assembly and disassembly.
Long-nose pliers		Component removal and replacement.
Vacuum solder extractor	No static charge retention.	Unsoldering static sensitive devices and components on boards.
Spray cleaner	No-noise	Switch cleaning.
IC-removal tool		Removing DIP IC packages.
Isopropyl alcohol	Reagent grade	Cleaning attenuator and front panel assemblies.

3-2 REMOVAL AND REPLACEMENT INSTRUCTIONS

The exploded view drawing in the "Section 7 Mechanical Parts List and Instrations" of this manual may be helpful during the removal and reinstallation of individual components or sub-assemblies.

CAUTION

To avoid electric shock, disconnect the instrument from the ac power source before removing or replacing any component or assembly.

3-2-1 Cover Removal

The covers must be removed before inspecting the inside or replacing faulty parts.

a. Rear Panel

1. Remove two screws (see Figure 3-2-1-1).
2. Pull off the rear panel from the instrument.

b. Top Cover

1. Remove six screws (see Figure 3-2-1-2).
2. Slide the cover slightly to rearward.
3. Widen on both edges of the cover and gently pull up it (see to NOTE).

c. Bottom Cover

1. Remove two screws (see Figure 3-2-1-3).
2. Lift the bottom cover.

NOTE

When removing or attaching the top cover, widen on both edges of the cover as shown in the figure below.

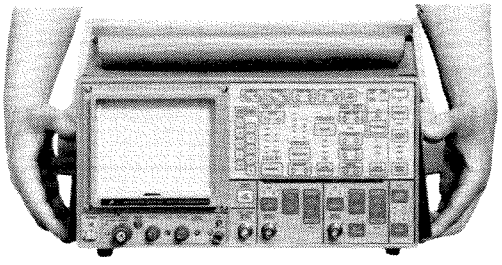


Figure 3-2-1-1. Screw Locations on Rear Panel

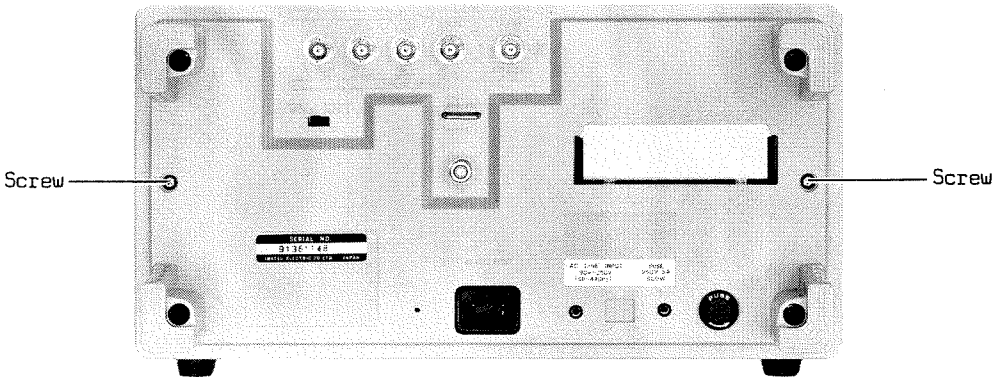


Figure 3-2-1-2. Screw Locations on Top and Side

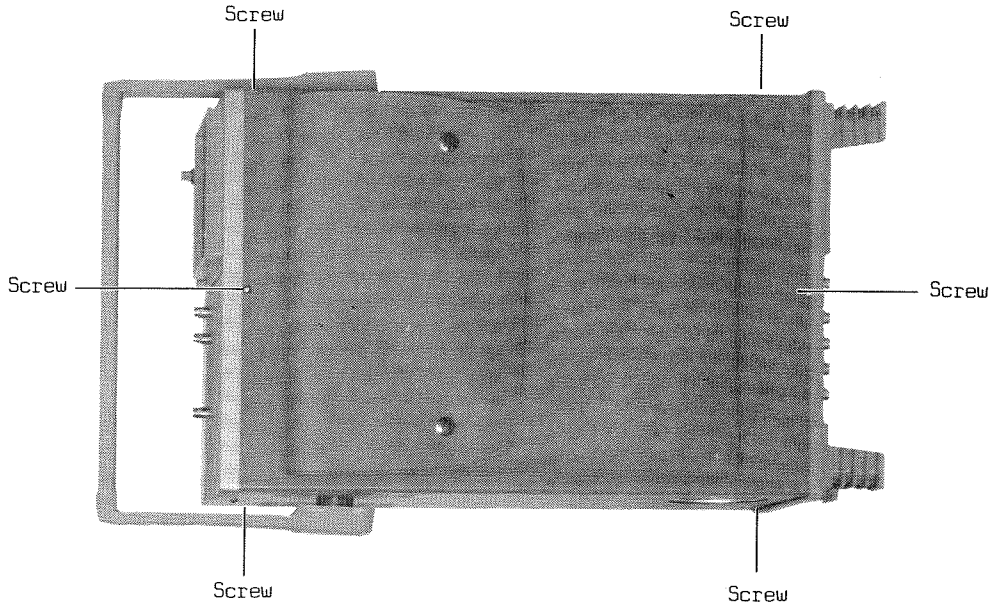
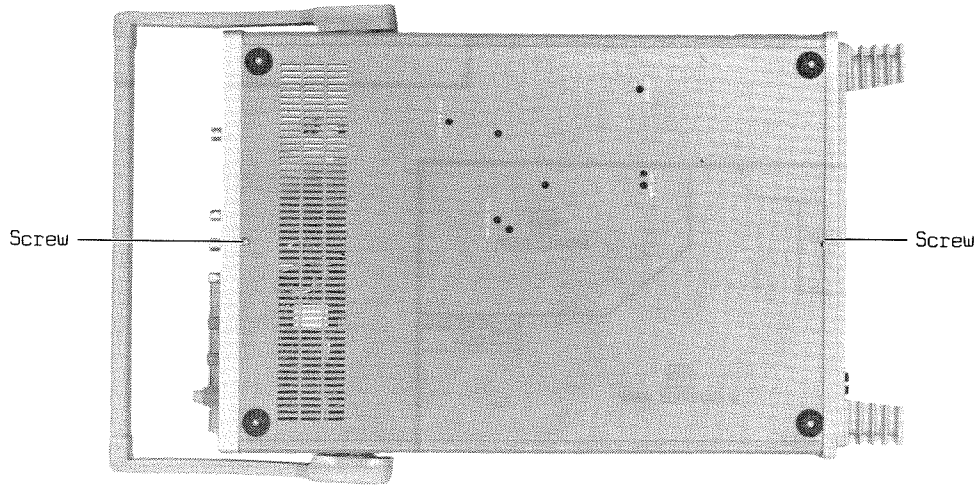


Figure 3-2-1-3. Screw Locations on Bottom



3-2-2 Printed Circuit Board Removal

Removal of each board is accomplished by the following steps, but disconnect the connectors and cables attached on the board is necessary.

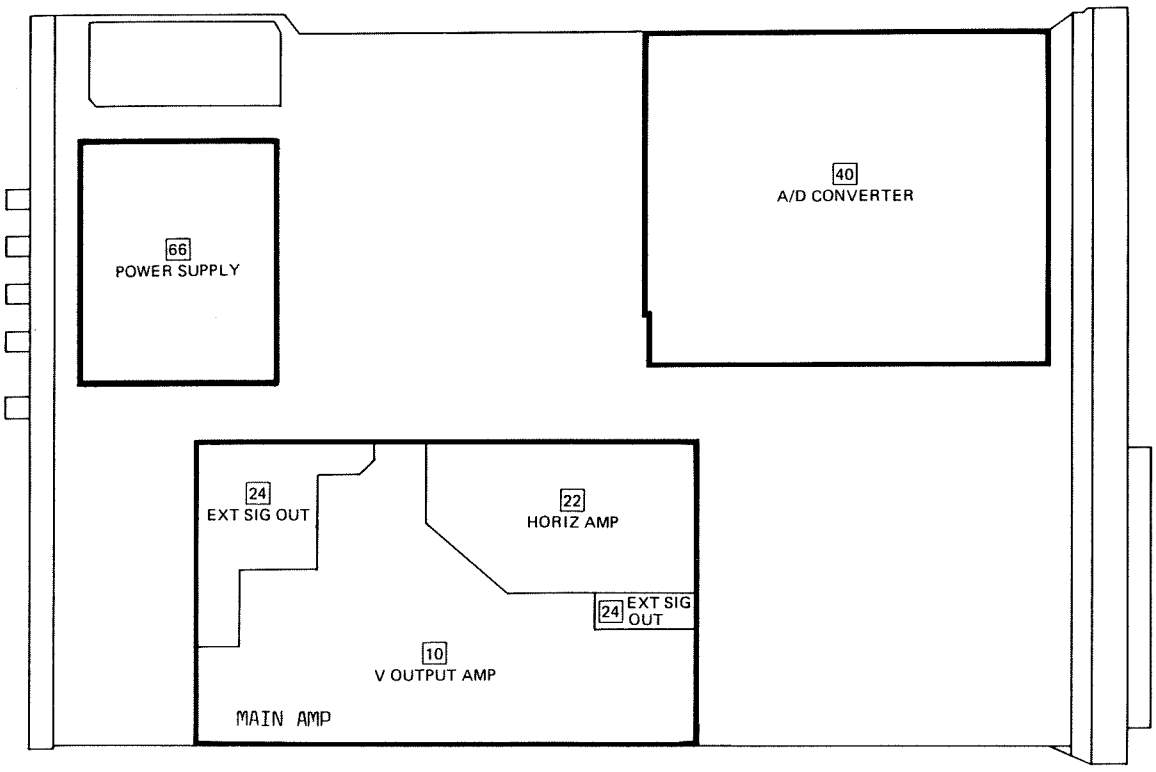
Top

See Figure 3-2-2-1.

a. MAIN AMP and POWER SUPPLY
   1. Remove screws that fasten the MAIN AMP or POWER SUPPLY board.
   2. Lift it from the chassis.

b. AD Converter
   Carefully pull outward (arrow-ward) as this board is not secured by the screw.

Figure 3-2-2-1. P.C.Bs on Top



Bottom

a. TRIG & Z AMP (see Figure 3-2-2-2)
   1. Remove a shaft for power switch.
   2. Remove screws that fasten the TRIG & Z AMP board.
   3. Lift it from the chassis.

b. PRE AMP (see Figure 3-2-2-2)
   1. Remove screws that fasten the PRE AMP board.
   2. Lift it from the chassis.

c. VR Circuit Board
   1. Pull out four knobs on the front panel (see Figure 3-2-2-3).
   2. Remove two screws on the front panel (see Figure 3-2-2-3).
   3. Remove three nuts (see Figure 3-2-2-3).
   4. Remove screws holding the VR circuit board (see Figure 2-3-2-2).
   5. Lift it from the chassis.

d. Power Supply
   1. Remove screws that fasten the power supply.
   2. Lift it from the chassis.

Figure 3-2-2-3. VR Circuit on Front Panel

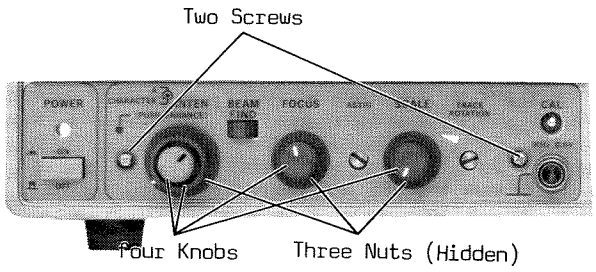
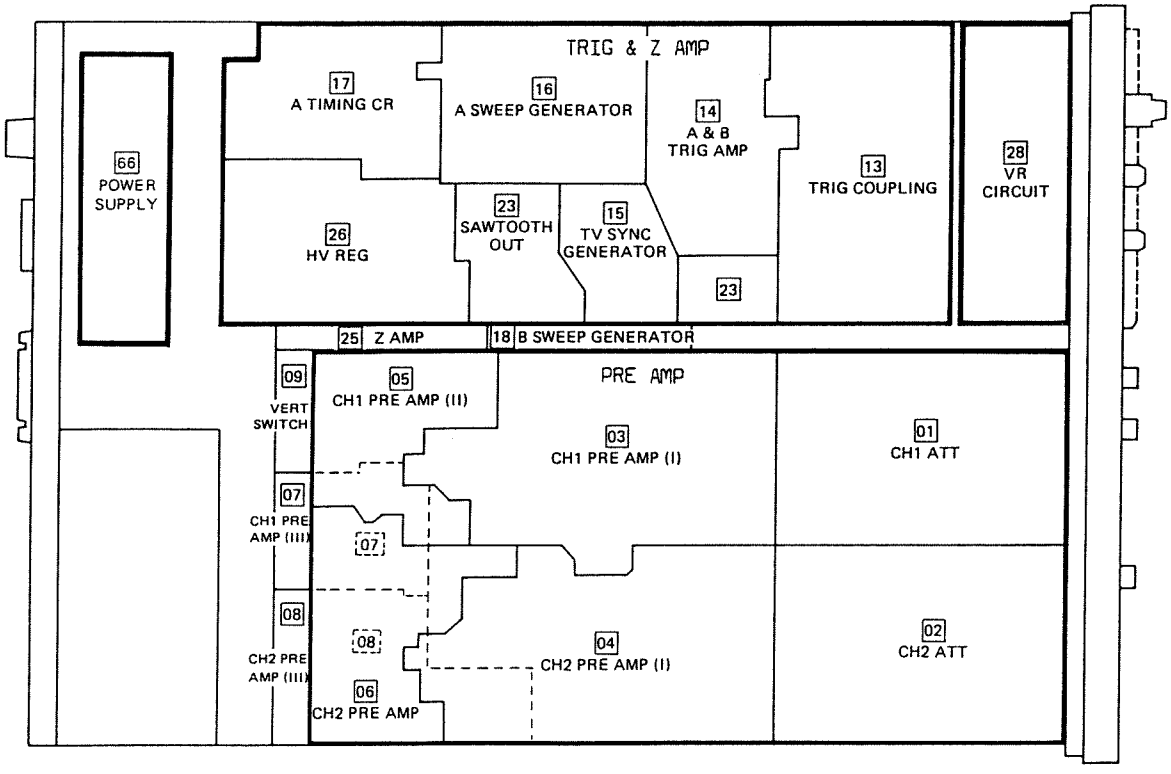


Figure 3-2-2-2. P.C.Bs on Bottom

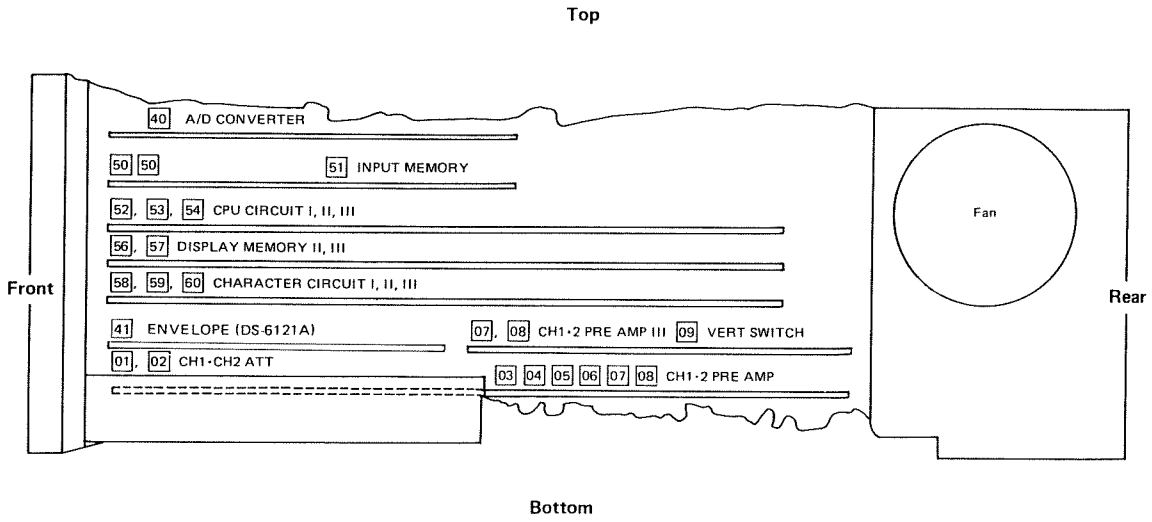


Right Side

a. Multi-board (DS-6121 five P.C.Bs except [41], DS-6121A six P.C.Bs)
   1. Remove the AD converter board (refer to top).
   2. Pull out them one by one from top.

b. H DISPLAY
   1. Remove the PRE AMP board (refer to bottom).
   2. Remove the TRIG & Z AMP board (refer to bottom).
   3. Remove screws that fasten the H DISPLAY board.
   4. Lift it gently from the chassis.

Figure 3-2-2-4. P.C.Bs on Right Side



3-2-3 Printed Circuit Board Parts Replacement

In replacing diodes, transistors, IC's, resistors, or capacitors, on a printed circuit board, use your soldering iron carefully so that neither the copper foil of the printed circuit board will be peeled off nor any parts on the circuit board will be damaged.

Because the semiconductors, such as transistors and diodes, are not thermal-resistant, pinch the leads with tweezers and solder them quickly component so that the heat of the soldering iron will not be directly conveyed to the semiconductor. Diodes and transistors used for replacement have good performance.

The resistors, capacitors, and other passive elements used in the instrument are carefully selected so any replacement parts to be used in their place must have good ones. (See Section 6 Electrical Parts List.)

Electrode contact of transistor or diode and serious variation of their characteristics may incidentally make a resistor burn or a capacitor short-circuit. If such a trouble should occur, eliminate the cause of it before replacing the faulty part.

3-2-4 Replacing Resistors, Diodes or ICs

In replacing a transistor, diode, or IC, make sure of the electrodes.

Particularly, transistors must be replaced with ones that have good performance. The transistors that have been specially selected are moted in the schematic diagrams.

3-2-5 High-Voltage Power Transformer Replacement

Care must be taken in replacing the high-voltage power transformer which supplies high voltage to the CRT because the CRT circuit may be live with high voltage. The removal procedure is as follows:

1. Remove the rear panel, and top and bottom covers.
2. Remove the two screws that fasten the high-voltage case, and remove the case.
3. Remove the three screws that fasten the printed circuit board for the high-voltage circuit, disengage the printed circuit board connector and transistor connector, and remove the printed circuit board.
4. The high-voltage power transformer is soldered on the printed circuit board. It must be unsoldered by using a soldering iron. When the high-voltage power transformer has been replaced, readjustment is necessary.

3-2-6 CRT Replacement

Handle the CRT carefully in replacing it because it will be damaged easily by dropping or shock. Care must be also taken not to apply too much strain to the deflection pin to prevent the glass from cracking.

The CRT removal procedure is as follows:

1. Remove the rear panel and the top cover.
2. Remove the screws that fasten the case for the GP-IB or the RS-232-C option and remove the case.
3. Remove the screws that fasten a metal fitting and for the CRT and remove the metal fitting.
4. Disconnect the CRT socket.
5. Remove the anode cap after discharging it because it might retain a high voltage charge.
6. Remove the screws on the MAIN AMP board (refer to top).
7. Disconnect the wires from the deflection pin. The blue and yellow leads are for vertical deflection, the white and black leads for horizontal deflection, and the red lead is for the negative electrode of Q3 of V1 (CRT). Disconnect the leads with care so that they will not be rewired to the deflection pin in the wrong way.
8. Disconnect the leads (white, black) from the connector J2491 for the trace rotation.
9. Disconnect the leads (green, blue) from the connector J2805 for the ORTHOGONALITY.
10. Lift the MAIN AMP board slightly over the CRT.
11. Remove the two screws that fasten the CRT clamps to the rear sub panel.
12. Loosen the long screw for the CRT clamps that fasten the CRT.
13. Remove the four screws from the CRT mounting bezel at the front panel and remove the bezel.
14. Slightly pull the CRT and shield case rearward, lift the front end of the CRT and pull it forward until it comes out.
15. Pull the CRT carefully from the shield case.

Reverse the above procedure for installing the CRT. If the CRT has been replaced, readjustments must be made by referring to "Section 4 Check and Adjustment".

Figure 3-2-6-1. CRT Replacement I

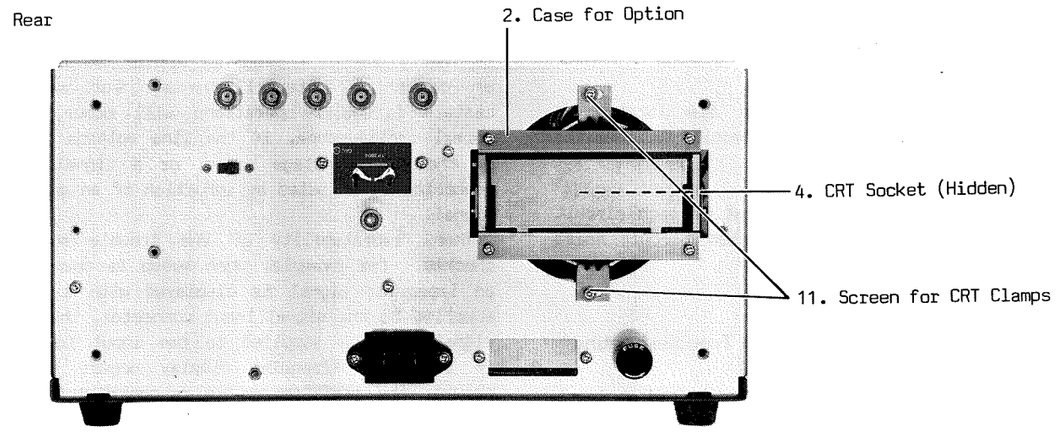
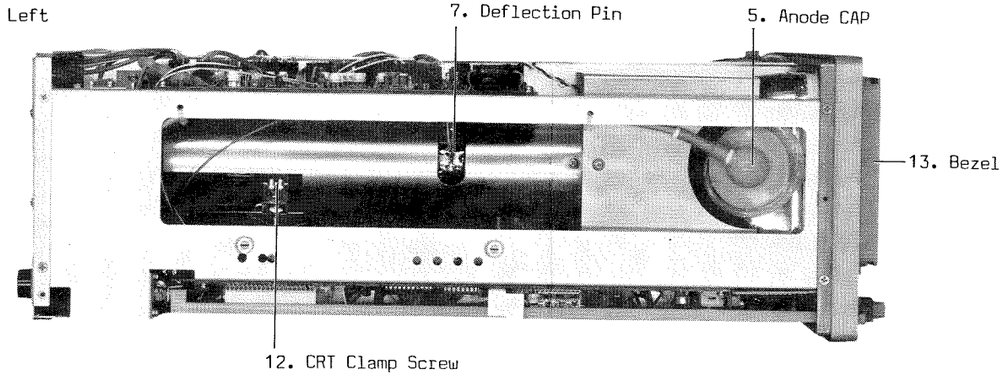


Figure 3-2-6-2. CRT Replacement II



3-3 TROUBLESHOOTING

3-3-1 Troubleshooting Reference

Schematic Diagrams

Complete schematic diagrams are located on tabbed foldout pages in the "Section 5 Schematic Diagram".

Circuit Board Locations

The placement in the instrument of each circuit board is shown in 3-2-2 Printed Circuit Board Location (see page 3-4).

3-3-2 Instruments Required for Troubleshooting

The following instruments are required at least for troubleshooting of this oscilloscope.

1. Multimeter
   - Input resistance: 10 MΩ
   - Voltage range: 0 to 300 V and special position for 2 kV
   - Ohm-range: 0 to 100 MΩ
2. Transistor Curve Tracer
3. Oscilloscope
   - Frequency response: DC to 100 MHz
   - Deflection factor: 5 mV/div

3-3-3 Troubleshooting Steps

The first thing in troubleshooting is to examine if a irregular event like "a circuit trouble" is really due to a troubles within the circuit, or caused by external events. For example, certain irregular operations will occur, in a normal oscilloscope, if the line voltage is out of the rated voltage renge, or a signal input connector is affected by induction of an external signal.

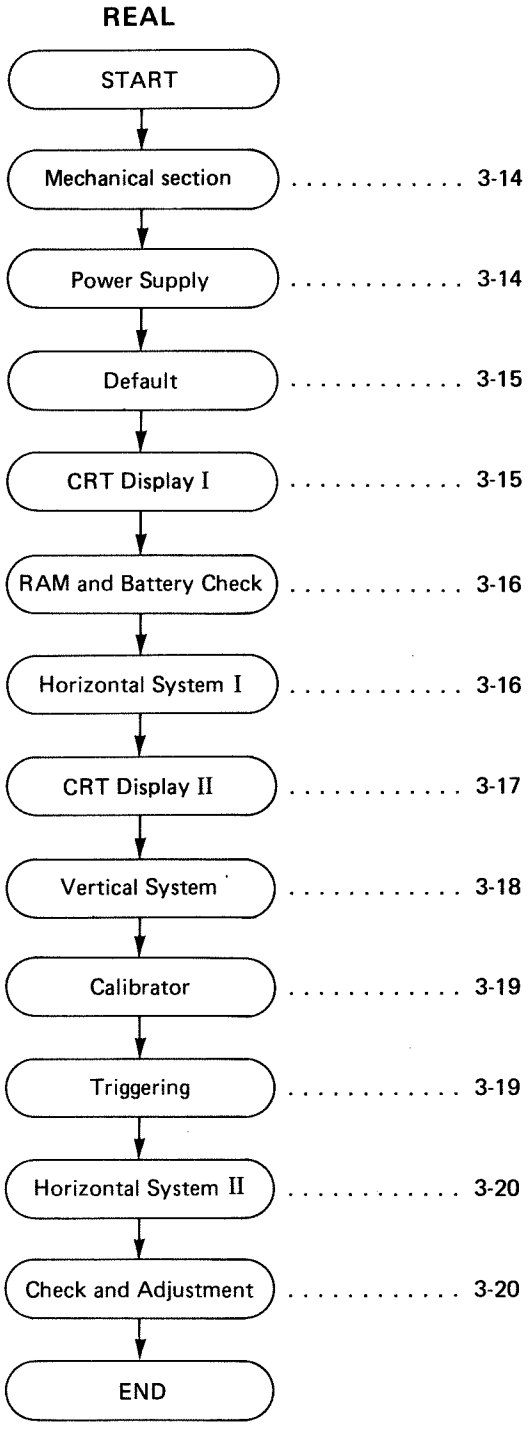
Then, repeatability of the trouble must be checked. For example, when sweep is normal but an irregular signal is displayed with a signal supplied to the signal input connector, the other signal must be supplied to the input to check if the same irregular display occurs (if it occurs, the oscilloscope is responsible for the trouble).

When troubles persist against these preparatory checks, the following actual steps must be performed.

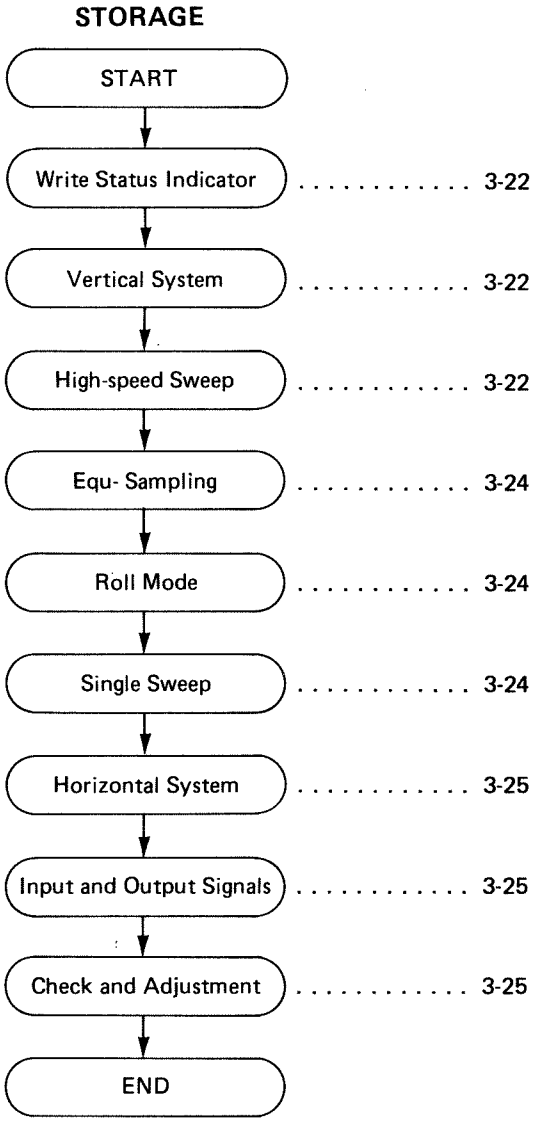
1. Remove the covers from the instrument and ascertain the circuit which has the trouble by the troubleshooting flow chart.
2. Visually inspect parts, wirings, coupling of connectors, soldering and copper foils of the circuit board, which are suspect.
3. Check the action of the ascertained circuit by using a multimeter or test oscilloscope and refering the voltages and waveforms shown in the schematic diagram.
4. Finally, check suspect parts for the trouble by using a multimeter or curve tracer and replace the defective parts.

Troubleshooting Chart Index

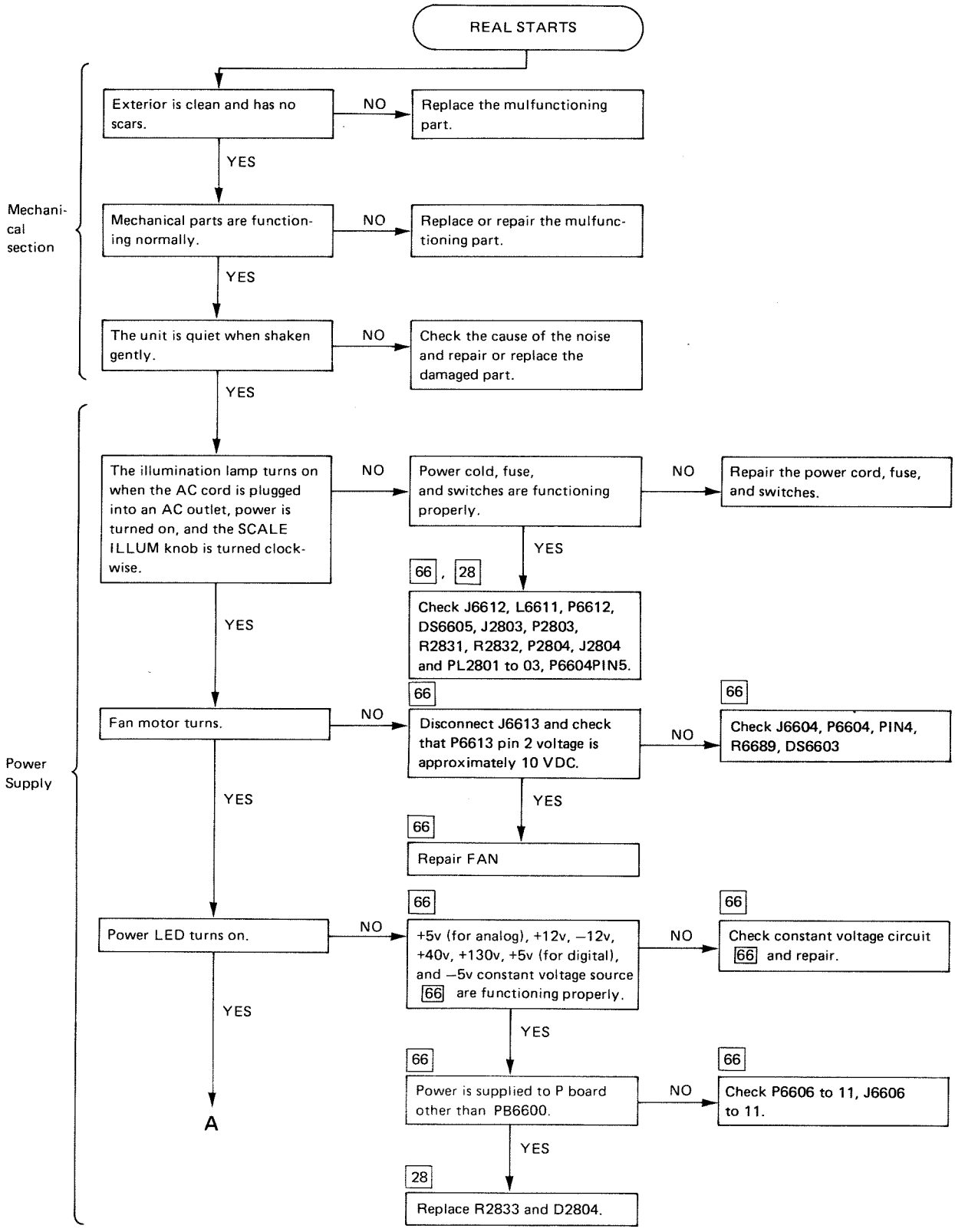
Real Section

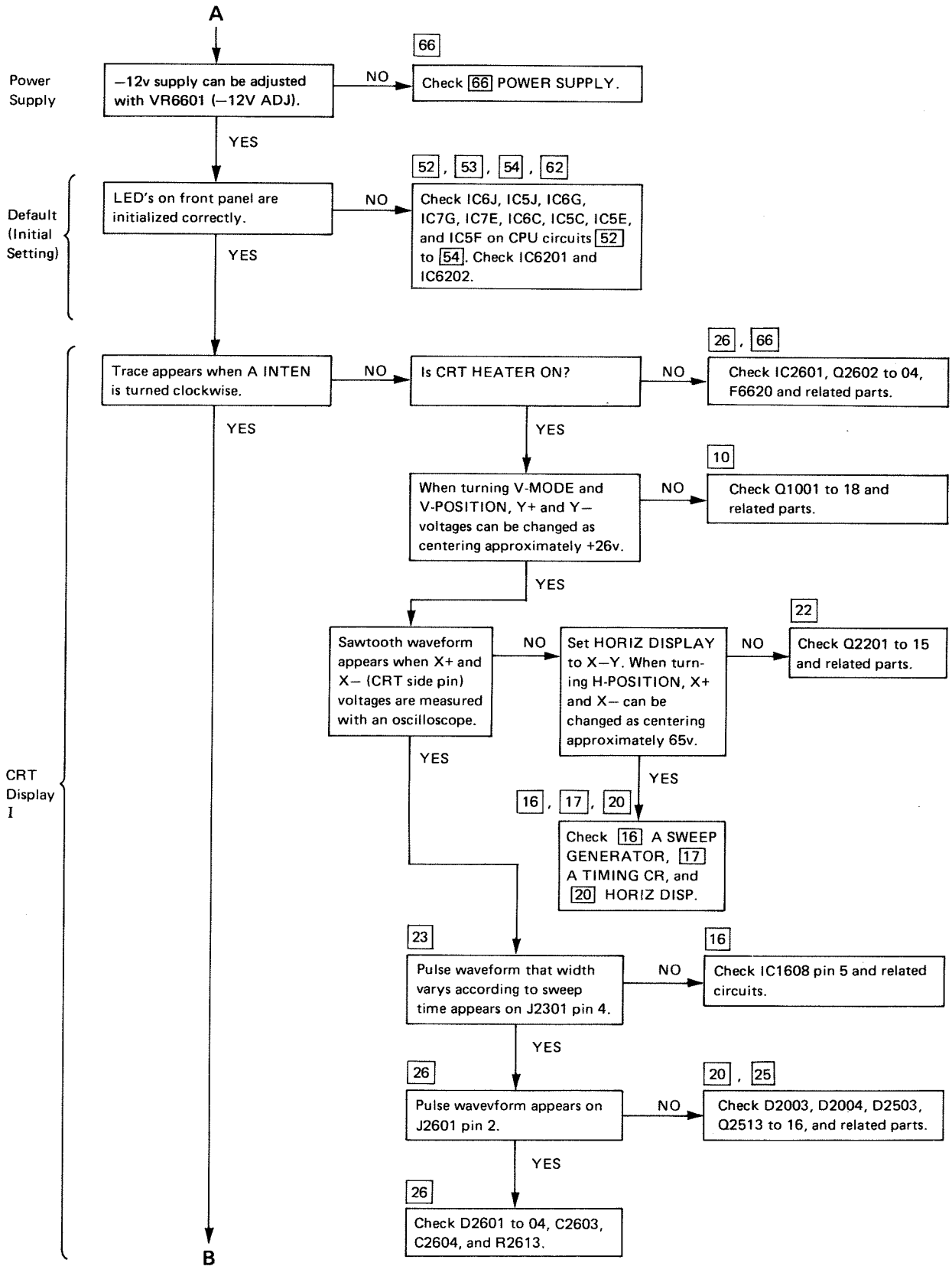


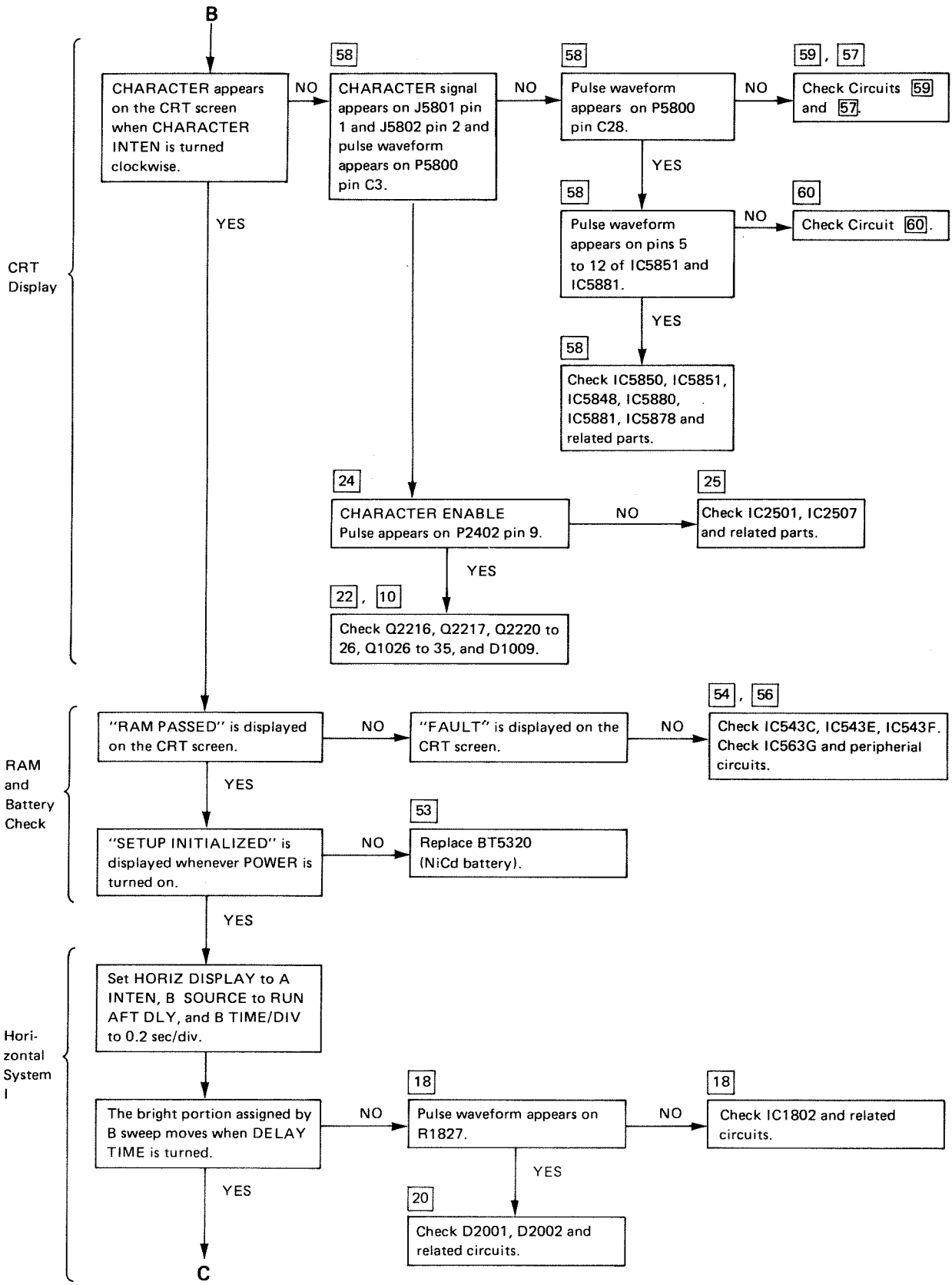
Storage Section

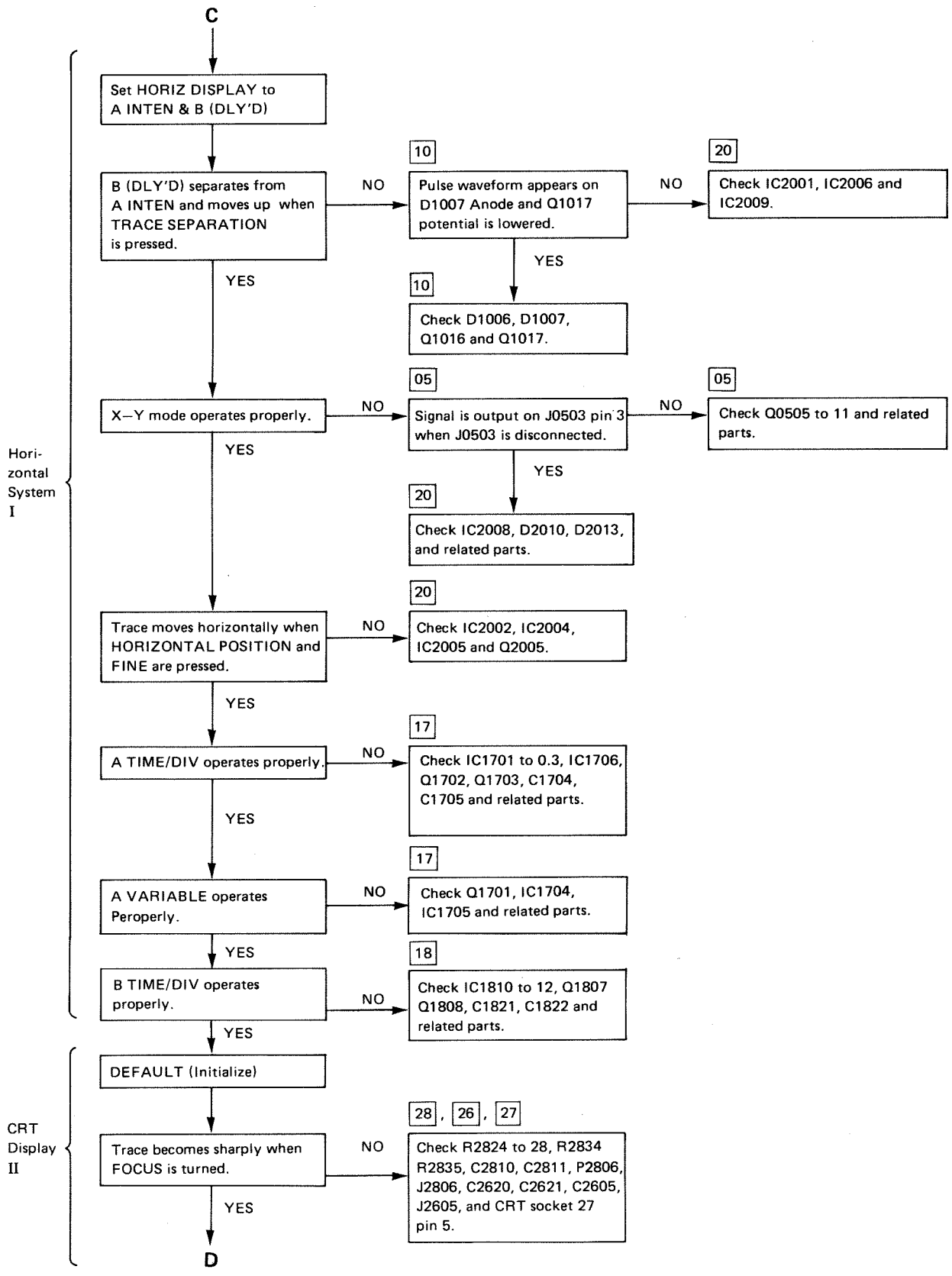


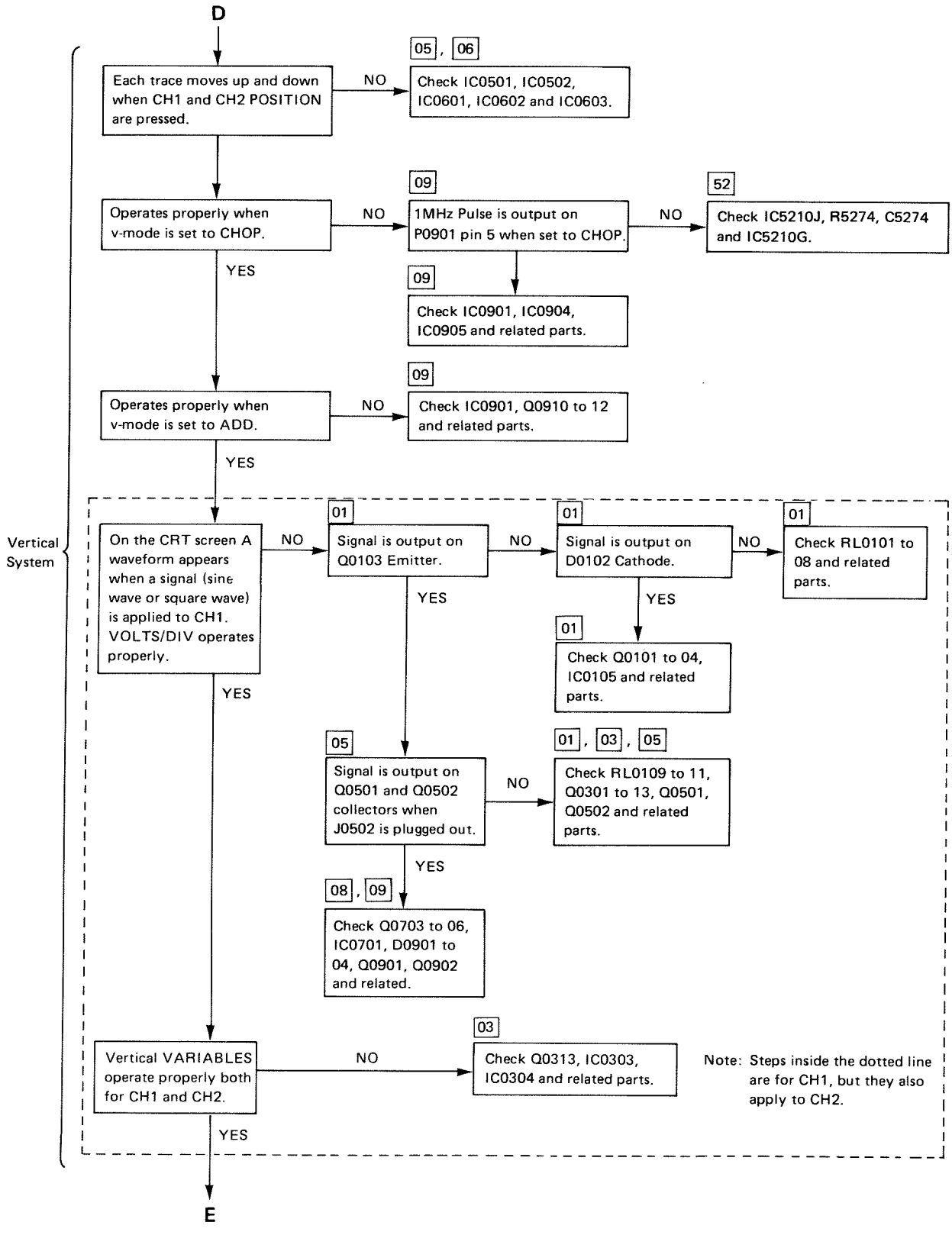
REAL

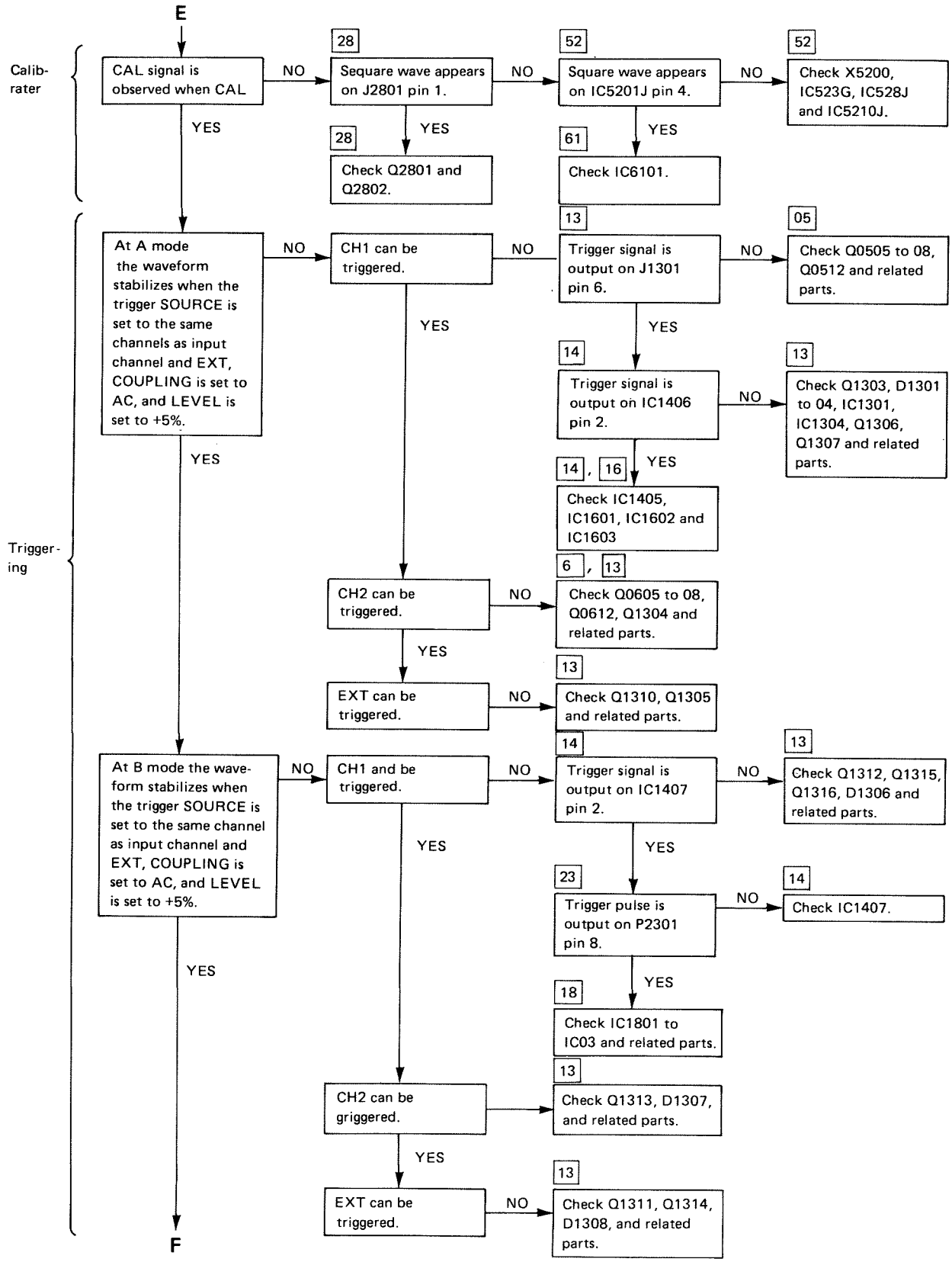

REAL STARTS
Mechanical section
Exterior is clean and has no scars.
NO
Replace the mulfunctioning part.
YES
Mechanical parts are functioning normally.
NO
Replace or repair the mulfunctioning part.
YES
The unit is quiet when shaken gently.
NO
Check the cause of the noise and repair or replace the damaged part.
YES
Power Supply
The illumination lamp turns on when the AC cord is plugged into an AC outlet, power is turned on, and the SCALE ILLUM knob is turned clockwise.
NO
Power cold, fuse, and switches are functioning properly.
NO
Repair the power cord, fuse, and switches.
YES
66 , 28
Check J6612, L6611, P6612, DS6605, J2803, P2803, R2831, R2832, P2804, J2804 and PL2801 to 03, P6604PIN5.
YES
66
Fan motor turns.
NO
Disconnect J6613 and check that P6613 pin 2 voltage is approximately 10 VDC.
NO
66
Check J6604, P6604, PIN4, R6689, DS6603
YES
66
Repair FAN
YES
66
Power LED turns on.
NO
+5v (for analog), +12v, −12v, +40v, +130v, +5v (for digital), and −5v constant voltage source 66 are functioning properly.
NO
66
Check constant voltage circuit 66 and repair.
YES
66
Power is supplied to P board other than PB6600.
NO
66
Check P6606 to 11, J6606 to 11.
YES
28
Replace R2833 and D2804.
YES
A

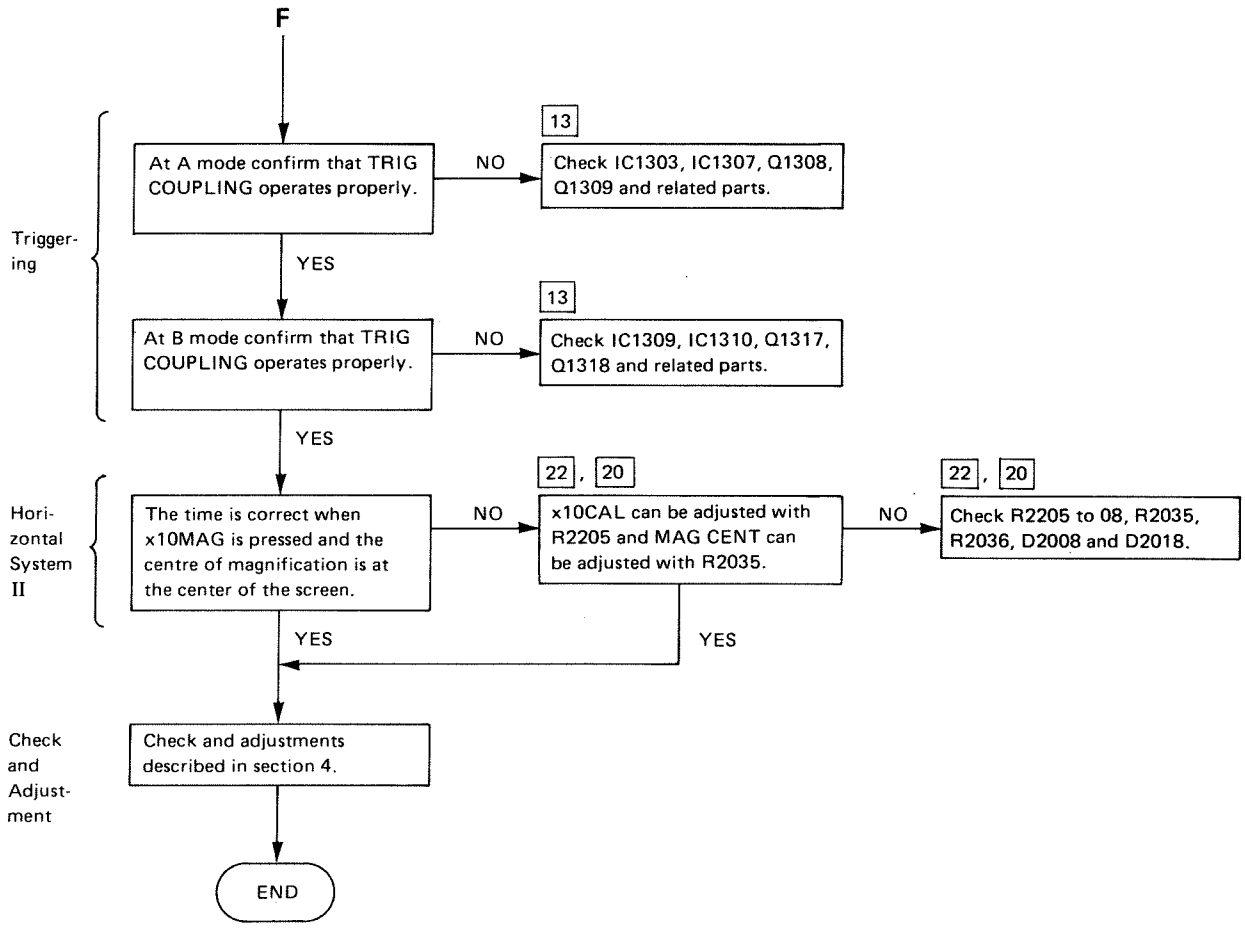

A
Power Supply
−12v supply can be adjusted with VR6601 (−12V ADJ).
NO
66
Check 66 POWER SUPPLY.
YES
Default (Initial Setting)
LED's on front panel are initialized correctly.
NO
52, 53, 54, 62
Check IC6J, IC5J, IC6G, IC7G, IC7E, IC6C, IC5C, IC5E, and IC5F on CPU circuits 52 to 54. Check IC6201 and IC6202.
YES
CRT Display I
Trace appears when A INTEN is turned clockwise.
NO
Is CRT HEATER ON?
NO
26, 66
Check IC2601, Q2602 to 04, F6620 and related parts.
YES
YES
When turning V-MODE and V-POSITION, Y+ and Y− voltages can be changed as centering approximately +26v.
NO
10
Check Q1001 to 18 and related parts.
YES
Sawtooth waveform appears when X+ and X− (CRT side pin) voltages are measured with an oscilloscope.
NO
Set HORIZ DISPLAY to X−Y. When turning H-POSITION, X+ and X− can be changed as centering approximately 65v.
NO
22
Check Q2201 to 15 and related parts.
YES
YES
16, 17, 20
Check 16 A SWEEP GENERATOR, 17 A TIMING CR, and 20 HORIZ DISP.
23
Pulse waveform that width varys according to sweep time appears on J2301 pin 4.
NO
16
Check IC1608 pin 5 and related circuits.
YES
26
Pulse wavevform appears on J2601 pin 2.
NO
20, 25
Check D2003, D2004, D2503, Q2513 to 16, and related parts.
YES
26
Check D2601 to 04, C2603, C2604, and R2613.
B


B
CRT Display
CHARACTER appears on the CRT screen when CHARACTER INTEN is turned clockwise.
NO
58
CHARACTER signal appears on J5801 pin 1 and J5802 pin 2 and pulse waveform appears on P5800 pin C3.
NO
58
Pulse waveform appears on P5800 pin C28.
NO
59, 57
Check Circuits 59 and 57.
YES
58
Pulse waveform appears on pins 5 to 12 of IC5851 and IC5881.
NO
60
Check Circuit 60.
YES
58
Check IC5850, IC5851, IC5848, IC5880, IC5881, IC5878 and related parts.
YES
24
CHARACTER ENABLE Pulse appears on P2402 pin 9.
NO
25
Check IC2501, IC2507 and related parts.
YES
22, 10
Check Q2216, Q2217, Q2220 to 26, Q1026 to 35, and D1009.
RAM and Battery Check
"RAM PASSED" is displayed on the CRT screen.
NO
"FAULT" is displayed on the CRT screen.
NO
54, 56
Check IC543C, IC543E, IC543F. Check IC563G and peripherial circuits.
YES
"SETUP INITIALIZED" is displayed whenever POWER is turned on.
NO
53
Replace BT5320 (NiCd battery).
YES
Horizontal System I
Set HORIZ DISPLAY to A INTEN, B SOURCE to RUN AFT DLY, and B TIME/DIV to 0.2 sec/div.
The bright portion assigned by B sweep moves when DELAY TIME is turned.
NO
18
Pulse waveform appears on R1827.
NO
18
Check IC1802 and related circuits.
YES
20
Check D2001, D2002 and related circuits.
YES
C

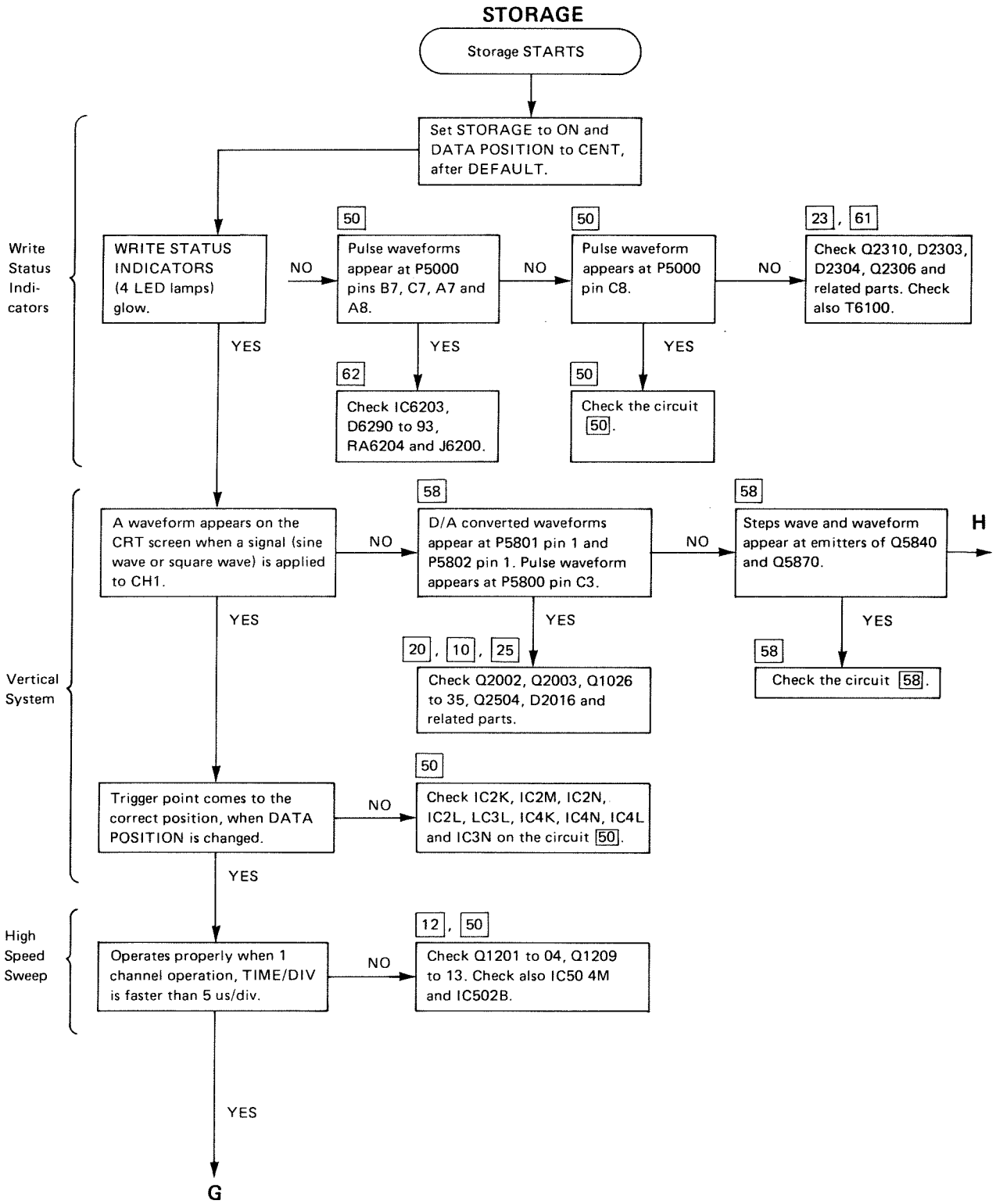

C
Set HORIZ DISPLAY to A INTEN & B (DLY'D)
B (DLY'D) separates from A INTEN and moves up when TRACE SEPARATION is pressed.
NO
10
Pulse waveform appears on D1007 Anode and Q1017 potential is lowered.
NO
20
Check IC2001, IC2006 and IC2009.
YES
10
Check D1006, D1007, Q1016 and Q1017.
YES
X–Y mode operates properly.
NO
05
Signal is output on J0503 pin 3 when J0503 is disconnected.
NO
05
Check Q0505 to 11 and related parts.
YES
20
Check IC2008, D2010, D2013, and related parts.
YES
Trace moves horizontally when HORIZONTAL POSITION and FINE are pressed.
NO
20
Check IC2002, IC2004, IC2005 and Q2005.
YES
A TIME/DIV operates properly.
NO
17
Check IC1701 to 0.3, IC1706, Q1702, Q1703, C1704, C1705 and related parts.
YES
A VARIABLE operates Peroperly.
NO
17
Check Q1701, IC1704, IC1705 and related parts.
YES
B TIME/DIV operates properly.
NO
18
Check IC1810 to 12, Q1807 Q1808, C1821, C1822 and related parts.
YES
DEFAULT (Initialize)
Trace becomes sharply when FOCUS is turned.
NO
28, 26, 27
Check R2824 to 28, R2834 R2835, C2810, C2811, P2806, J2806, C2620, C2621, C2605, J2605, and CRT socket 27 pin 5.
YES
D
Hori-zontal System I
CRT Display II

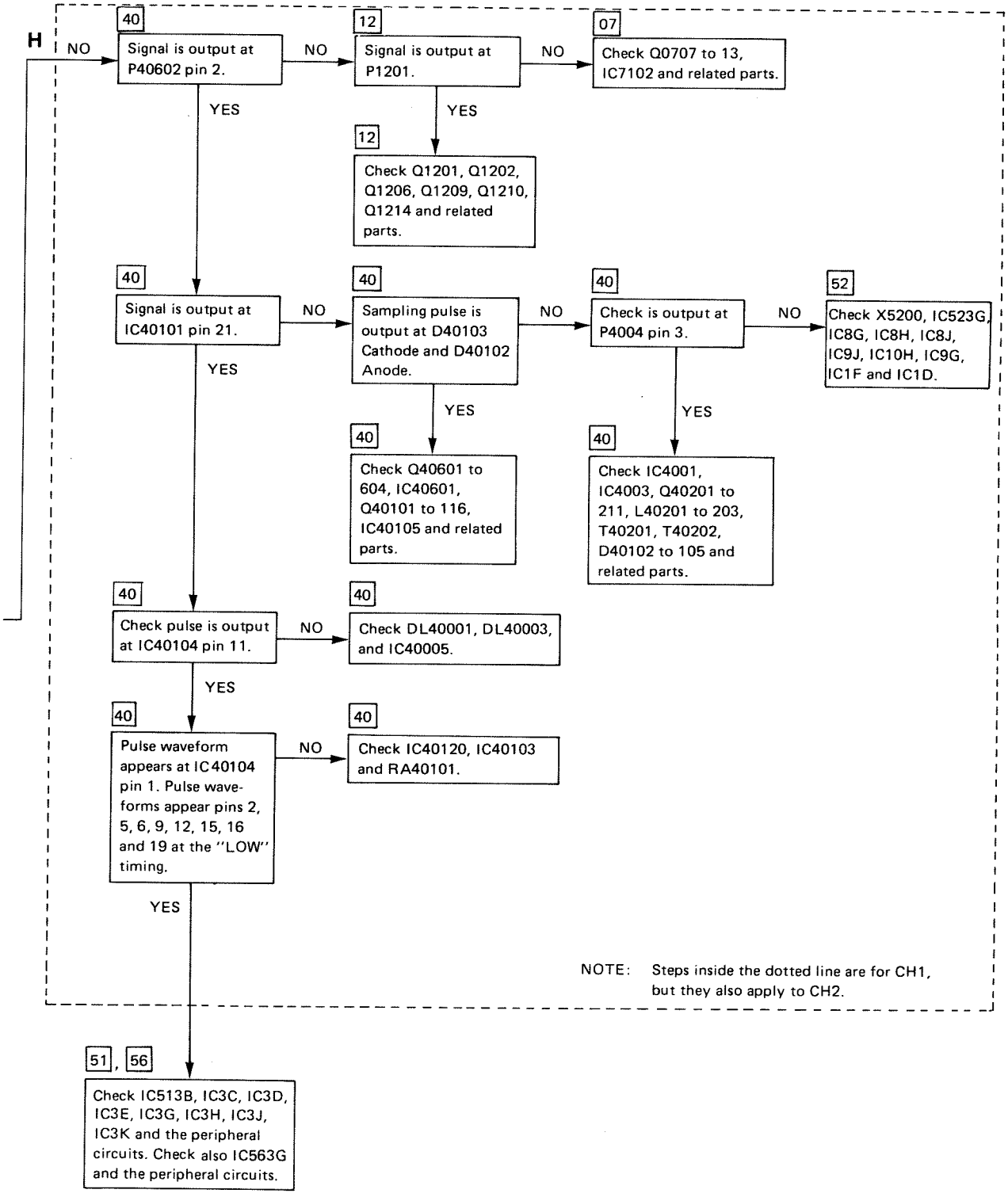

D
Each trace moves up and down when CH1 and CH2 POSITION are pressed.
NO
05, 06
Check IC0501, IC0502, IC0601, IC0602 and IC0603.
Operates properly when v-mode is set to CHOP.
NO
09
1MHz Pulse is output on P0901 pin 5 when set to CHOP.
NO
52
Check IC5210J, R5274, C5274 and IC5210G.
YES
09
Check IC0901, IC0904, IC0905 and related parts.
Operates properly when v-mode is set to ADD.
NO
09
Check IC0901, Q0910 to 12 and related parts.
YES
Vertical System
On the CRT screen A waveform appears when a signal (sine wave or square wave) is applied to CH1. VOLTS/DIV operates properly.
NO
01
Signal is output on Q0103 Emitter.
NO
01
Signal is output on D0102 Cathode.
NO
01
Check RL0101 to 08 and related parts.
YES
YES
01
Check Q0101 to 04, IC0105 and related parts.
YES
05
Signal is output on Q0501 and Q0502 collectors when J0502 is plugged out.
NO
01, 03, 05
Check RL0109 to 11, Q0301 to 13, Q0501, Q0502 and related parts.
YES
08, 09
Check Q0703 to 06, IC0701, D0901 to 04, Q0901, Q0902 and related.
Vertical VARIABLES operate properly both for CH1 and CH2.
NO
03
Check Q0313, IC0303, IC0304 and related parts.
YES
E
Note: Steps inside the dotted line are for CH1, but they also apply to CH2.

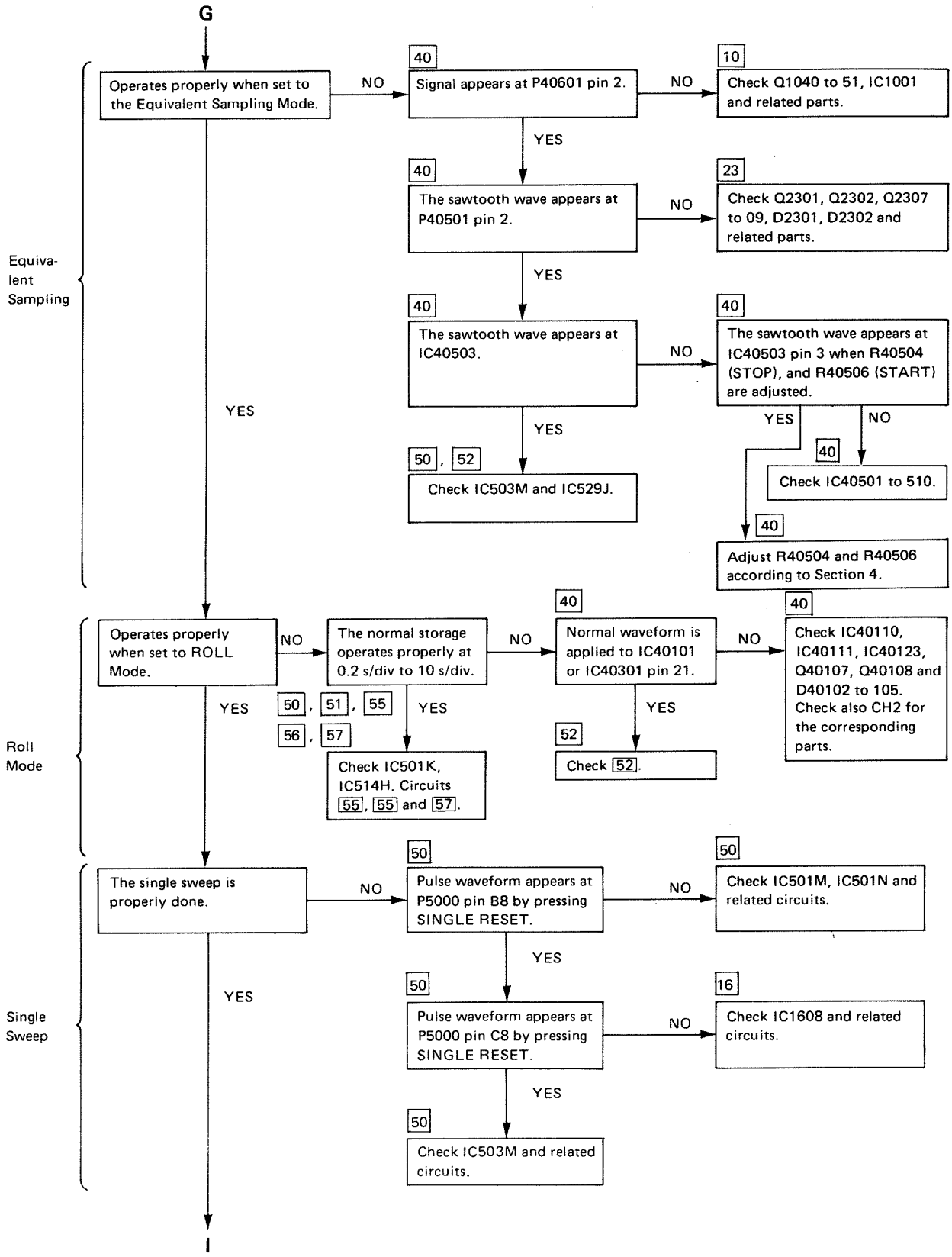

E
Calib-rater
CAL signal is observed when CAL
NO
28
Sequare wave appears on J2801 pin 1.
NO
52
Square wave appears on IC5201J pin 4.
NO
52
Check X5200, IC523G, IC528J and IC5210J.
YES
28
YES
Check Q2801 and Q2802.
61
YES
Check IC6101.
Trigger-ing
At A mode the waveform stabilizes when the trigger SOURCE is set to the same channels as input channel and EXT, COUPLING is set to AC, and LEVEL is set to +5%.
NO
CH1 can be triggered.
NO
13
Trigger signal is output on J1301 pin 6.
NO
05
Check Q0505 to 08, Q0512 and related parts.
YES
YES
14
Trigger signal is output on IC1406 pin 2.
NO
13
Check Q1303, D1301 to 04, IC1301, IC1304, Q1306, Q1307 and related parts.
YES
14, 16
YES
Check IC1405, IC1601, IC1602 and IC1603
6, 13
CH2 can be triggered.
NO
Check Q0605 to 08, Q0612, Q1304 and related parts.
YES
13
EXT can be triggered.
NO
Check Q1310, Q1305 and related parts.
At B mode the waveform stabilizes when the trigger SOURCE is set to the same channel as input channel and EXT, COUPLING is set to AC, and LEVEL is set to +5%.
NO
CH1 and be triggered.
NO
14
Trigger signal is output on IC1407 pin 2.
NO
13
Check Q1312, Q1315, Q1316, D1306 and related parts.
YES
YES
23
Trigger pulse is output on P2301 pin 8.
NO
14
Check IC1407.
YES
18
Check IC1801 to IC03 and related parts.
YES
13
CH2 can be griggered.
Check Q1313, D1307, and related parts.
YES
13
EXT can be triggered.
NO
Check Q1311, Q1314, D1308, and related parts.
F

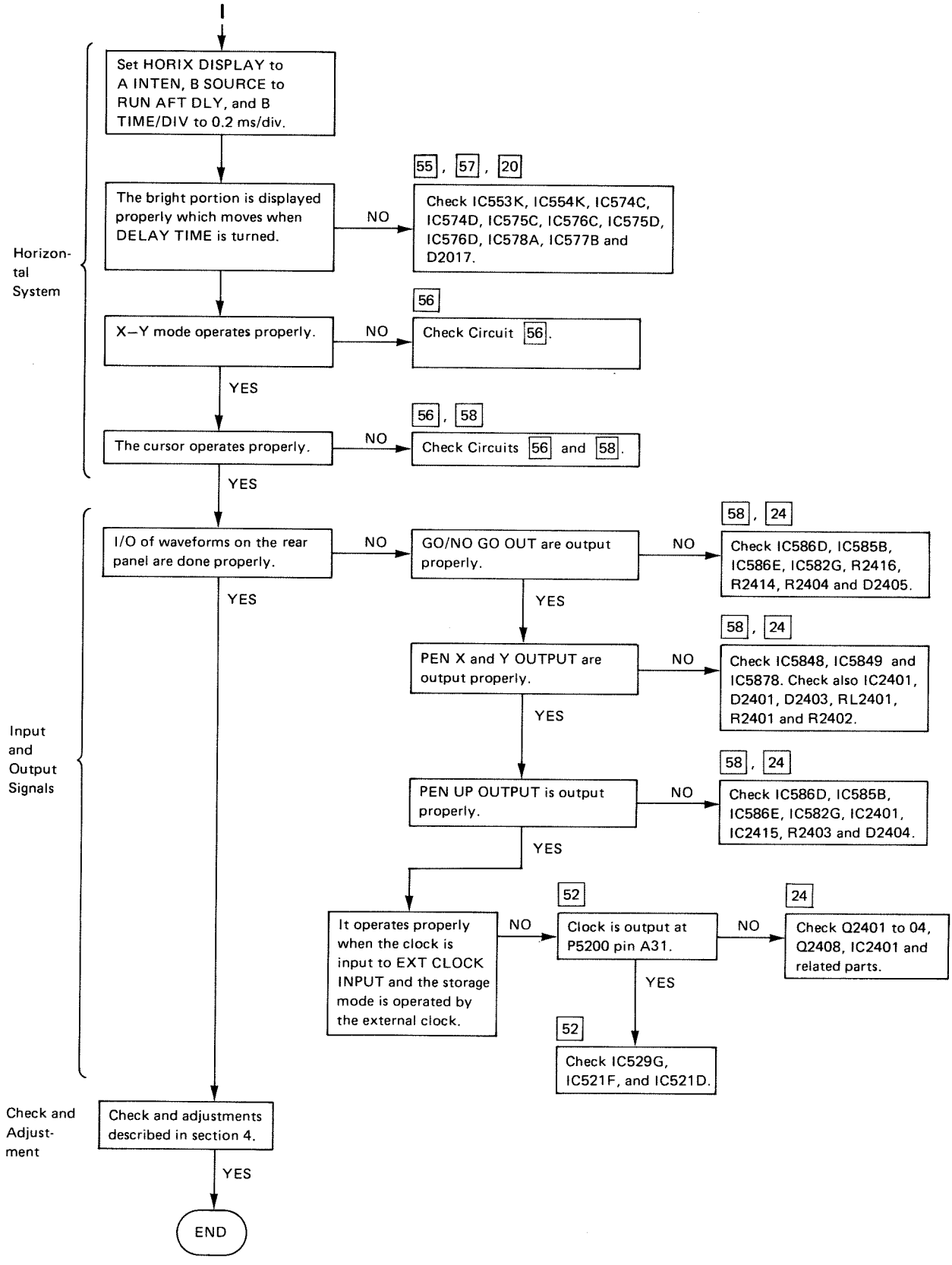

F
Trigger-ing
At A mode confirm that TRIG COUPLING operates properly.
NO
13
Check IC1303, IC1307, Q1308, Q1309 and related parts.
YES
At B mode confirm that TRIG COUPLING operates properly.
NO
13
Check IC1309, IC1310, Q1317, Q1318 and related parts.
YES
Hori-zontal System II
The time is correct when x10MAG is pressed and the centre of magnification is at the center of the screen.
NO
22, 20
x10CAL can be adjusted with R2205 and MAG CENT can be adjusted with R2035.
NO
22, 20
Check R2205 to 08, R2035, R2036, D2008 and D2018.
YES
YES
Check and Adjust-ment
Check and adjustments described in section 4.
END

Storage Section




H
40
Signal is output at P40602 pin 2.
NO
YES
12
Signal is output at P1201.
NO
YES
07
Check Q0707 to 13, IC7102 and related parts.
12
Check Q1201, Q1202, Q1206, Q1209, Q1210, Q1214 and related parts.
40
Signal is output at IC40101 pin 21.
NO
YES
40
Sampling pulse is output at D40103 Cathode and D40102 Anode.
NO
YES
40
Check Q40601 to 604, IC40601, Q40101 to 116, IC40105 and related parts.
40
Check is output at P4004 pin 3.
NO
YES
52
Check X5200, IC523G, IC8G, IC8H, IC8J, IC9J, IC10H, IC9G, IC1F and IC1D.
40
Check IC4001, IC4003, Q40201 to 211, L40201 to 203, T40201, T40202, D40102 to 105 and related parts.
40
Check pulse is output at IC40104 pin 11.
NO
YES
40
Check DL40001, DL40003, and IC40005.
40
Pulse waveform appears at IC40104 pin 1. Pulse waveforms appear pins 2, 5, 6, 9, 12, 15, 16 and 19 at the "LOW" timing.
NO
YES
40
Check IC40120, IC40103 and RA40101.
NOTE: Steps inside the dotted line are for CH1, but they also apply to CH2.
51, 56
Check IC513B, IC3C, IC3D, IC3E, IC3G, IC3H, IC3J, IC3K and the peripheral circuits. Check also IC563G and the peripheral circuits.


G
Equiva-
lent
Sampling
Operates properly when set to the Equivalent Sampling Mode.
NO
40
Signal appears at P40601 pin 2.
NO
10
Check Q1040 to 51, IC1001 and related parts.
YES
40
The sawtooth wave appears at P40501 pin 2.
NO
23
Check Q2301, Q2302, Q2307 to 09, D2301, D2302 and related parts.
YES
40
The sawtooth wave appears at IC40503.
NO
40
The sawtooth wave appears at IC40503 pin 3 when R40504 (STOP), and R40506 (START) are adjusted.
YES
NO
YES
50, 52
Check IC503M and IC529J.
40
Check IC40501 to 510.
40
Adjust R40504 and R40506 according to Section 4.
YES
Roll
Mode
Operates properly when set to ROLL Mode.
NO
The normal storage operates properly at 0.2 s/div to 10 s/div.
NO
40
Normal waveform is applied to IC40101 or IC40301 pin 21.
NO
40
Check IC40110, IC40111, IC40123, Q40107, Q40108 and D40102 to 105. Check also CH2 for the corresponding parts.
YES
50, 51, 55, 56, 57
YES
Check IC501K, IC514H. Circuits 55, 55 and 57.
YES
52
Check 52.
Single
Sweep
The single sweep is properly done.
NO
50
Pulse waveform appears at P5000 pin B8 by pressing SINGLE RESET.
NO
50
Check IC501M, IC501N and related circuits.
YES
YES
50
Pulse waveform appears at P5000 pin C8 by pressing SINGLE RESET.
NO
16
Check IC1608 and related circuits.
YES
50
Check IC503M and related circuits.
I


Horizontal System
Set HORIX DISPLAY to A INTEN, B SOURCE to RUN AFT DLY, and B TIME/DIV to 0.2 ms/div.
The bright portion is displayed properly which moves when DELAY TIME is turned.
NO
55, 57, 20
Check IC553K, IC554K, IC574C, IC574D, IC575C, IC576C, IC575D, IC576D, IC578A, IC577B and D2017.
X–Y mode operates properly.
NO
56
Check Circuit 56.
YES
The cursor operates properly.
NO
56, 58
Check Circuits 56 and 58.
YES
Input and Output Signals
I/O of waveforms on the rear panel are done properly.
NO
GO/NO GO OUT are output properly.
NO
58, 24
Check IC586D, IC585B, IC586E, IC582G, R2416, R2414, R2404 and D2405.
YES
PEN X and Y OUTPUT are output properly.
NO
58, 24
Check IC5848, IC5849 and IC5878. Check also IC2401, D2401, D2403, RL2401, R2401 and R2402.
YES
PEN UP OUTPUT is output properly.
NO
58, 24
Check IC586D, IC585B, IC586E, IC582G, IC2401, IC2415, R2403 and D2404.
YES
It operates properly when the clock is input to EXT CLOCK INPUT and the storage mode is operated by the external clock.
NO
52
Clock is output at P5200 pin A31.
NO
24
Check Q2401 to 04, Q2408, IC2401 and related parts.
YES
52
Check IC529G, IC521F, and IC521D.
YES
Check and Adjustment
Check and adjustments described in section 4.
YES
END

Section 4 Check and Adjustment

4-1 GENERAL

Correct measurement requires the normal operation of each circuit in DS-6121/DS-6121A and satisfactory maintenance of their performance.

With the regular performance check and adjustment, DS-6121/DS-6121A can develop its functions in a reliable manner for a long period of service.

This section describes the appropriate method of check and adjustment.

4-2 PERIOD OF CHECK AND ADJUSTMENT

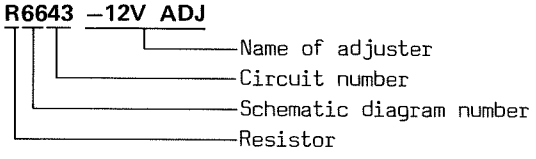
The regular and periodical check and adjustment of performance is necessary for correct measurement. The proper check intervals for DS-6121/DS-6121A are six months.

4-3 PRECAUTIONS FOR CHECK AND ADJUSTMENT

For the performance check and adjustment, pay attention to the following.

1. In each check and adjustment item, the description for the control knob manipulation presupposes the setting completed for item "4-6-1 Check and Adjustment". Whether the check and adjustment are carried out for all items or limited items, make sure to start the operation from the point where the setting has been made according to the preparation for check and adjustment.
2. Some signal generator outputs at a 50 Ω termination; so using a control cable with characteristic impedance of 50 Ω (e.g. BB-120 by Iwatsu), terminate the cable end at the scope with a 50 Ω terminator (e.g. BB-50M1 by Iwatsu).
3. The low-voltage power is supplied to all circuits. If its voltage or ripple goes outside the specified values, the other performance will be affected. If check and adjustment, therefore, check the low-voltage power supply first.
4. The CRT has a high-voltage. For its check and adjustment, be careful not to catch an electric shock.
5. An adjuster used for checking and adjustment has the following indication number.

Example



The above number specifies the 66th circuit diagram and 43rd resistor. 66 is displayed 66 on a printed circuit board as well as in a schematic diagram.

4-4 EQUIPMENT REQUIRED

The check and adjustment requires the equipment and accessories as described in Table 4-4-1. The equipment have the performance equal to or greater than those described in the table.

The signal connector of DS-6121/DS-6121A is BNC. If the terminator or signal output terminal is other than BNC, prepare a converter connector.

Table 4-4-1. List of Equipment Required

Equipment	Minimum Specifications	Purpose	Recommended Model
1. Scope calibrator • Calibration voltage generator Output voltage • Time-mark generator Repetition time • Sine wave generator Repetition frequency • Square wave generator Repetiton frequency Rise time	 0.12 mV to 60 V Accuracy: ±0.5% or less 20 ns to 2 s Accuracy: ±5% or less 1 kHz Accuracy: ±20% or less 50 Hz to 200 kHz 5 ns or less	Vertical, triggering, and horizontal checks and adjustments	Iwatsu SC-340
2. Fast rise square wave generator Repetition frequency Rise time	50 Hz to 200 kHz 1 ns or less	Vertical checks	
3. Standard signal generator Repetition frequency Output voltage	50 kHz to 100 MHz 60 mV or more	Pattern distortion, bandwidth and phase difference (on X-Y operation) checks and adjustments	
4. Function generator Repetition frequency Output voltage	10 Hz to 1 MHz 1 V or more	Vertical checks	Iwatsu FG-330
5. Digigal volt-meter Range	DC to 200 V dc Accuracy: ±0.2% + 1 dgt.	Low-voltage power supply checks and adjustments	Iwatsu SC-7401
6. High-voltage probe Range	DC to 20 kV dc Accuracy: ±3% + 1 dgt.	CRT cathode voltage checks and adjustments	High-voltage probe (Iwatsu SC-7401 option)

Table 4-4-1. List of Equipment Required (Cont.)

Equipment	Minimum Specifications	Purpose	Recommended Model
7. Test oscilloscope Bandwidth deflection factor	 DC to 10 MHz 1 mV/div	Low-voltage power supply checks and adjustments	Iwatsu SS-5705/06
8. Oscilloscope probe Attenuation ratio	 1 : 1	Low-voltage power supply checks and adjustments	Iwatsu SS-0001 to 3
9. Frequency counter Range Resolution	 10 Hz to 1.5 MHz 1 Hz	Calibration voltage checks and adjustments	Iwatsu SC-7101
10. Voltage regulator		AC line voltage range check	
11. Termination (2 required) Impedance	 50 Ω	Signal termination	Iwatsu BB-50M1
12. 6 dB divider		Input signal interconnection	Iwatsu B-5003
13. Coaxial cable (2 required) Impedance Length	 50 Ω 1.2 m	Signal input	Iwatsu BB-120C
14. Accessory probes Attenuation ratio	 10 : 1	Signal input	Iwatsu SS-0060
15. Screwdriver (Probe accessory)		Adjust variable resistors and capacitors	

4-5 CHECK AND ADJUSTMENT ITEMS

The check and adjustment items are shown in Table 4-5-1.

The right column indicates items that may be affected by adjustment. Together with one item, also check and adjust other items that may be affected by that item.

In check and adjustment of all items, do them in the following sequence.

Table 4-5-1. Items and Interactions

Order	Checks and Adjustment Items	Page	Checks and Adjustment Affected
	——— Power Supply and CRT ———		
1	4-7-1 Power Supply	4 - 12	All items
2	4-7-2 AC Voltage Range	4 - 13	
3	4-7-3 CRT Cathode Voltage	4 - 14	6, 8, 13, 15, 16, 21, 27, 28, 29, 41, 35, 36, 37, 38, 39
4	4-7-4 Intensity	4 - 15	5
5	4-7-5 Focus	4 - 16	
6	4-7-6 The Parallel of the Horizontal Trace and Horizontal Scale	4 - 16	
7	4-7-7 The Parallel of the Vertical Trace and Vertical Scale	4 - 17	
8	4-7-8 Pattern Distortion	4 - 18	16, 27, 28, 31, 35, 36, 37, 38, 39
	——— Calibrator Output ———		
9	4-8-1 Output Voltage	4 - 19	
10	4-8-2 Repetition Rate	4 - 19	
	——— Vertical Deflection System ———		
11	4-9-1 Preparation	4 - 20	
12	4-9-2 Vertical Balance	4 - 20	14, 18, 23, 24, 31, 36, 37, 38
13	4-9-3 Variable Reduction Ratio	4 - 21	14
14	4-9-4 Varaible Balance	4 - 21	18, 23, 24, 31, 36, 37, 38
15	4-9-5 Square Wave Characteristics I (Low Frequency)	4 - 22	16, 19, 32, 36, 37, 38, 39
16	4-9-6 Gain	4 - 24	15, 31, 36, 37, 38, 39
17	4-9-7 Attenuator Compensation	4 - 26	
18	4-9-8 Position Center, Variable Range and Polarity Center	4 - 28	33, 24, 31, 36, 37, 38
19	4-9-9 Square Wave Characteristics II (High Frequency)	4 - 30	15, 16, 20, 31, 32, 36, 37, 38, 39
20	4-9-10 Bandwidth	4 - 32	
21	4-9-11 Initial Position of Cursor and Character	4 - 34	36, 37, 38
22	4-9-12 Linearity	4 - 36	
23	4-9-13 ADD Balance	4 - 37	
	——— Triggering ———		
24	4-10-1 A Trigger	4 - 38	25
25	4-10-2 B Trigger	4 - 40	

Order	Checks and Adjustment Items	Page	Checks and Adjustment Affected
	——— Horizontal Deflection Systems ——		
26	4-11-1 Average Voltage of Horizontal Amplifier	4 - 41	
27	4-11-2 Sweep Time	4 - 41	28, 20, 36
28	4-11-3 Initial Position of Time Cursor	4 - 45	
29	4-11-4 Delay Start and Stop	4 - 46	
30	4-11-5 Delay Jitter	4 - 47	
	——————— X-Y Operation ———————		
31	4-12-1 Gain and Position	4 - 48	
32	4-12-2 Bandwidth	4 - 49	
33	4-12-3 Phase Difference	4 - 50	
	——————— A/D Converter ———————		
34	4-13-1 A/D IC Standard Voltage	4 - 51	35, 36, 37, 38, 39
35	4-13-2 SCOPE X POS and SCOPE GAIN	4 - 51	
36	4-13-3 Equ-sampling	4 - 52	37, 38, 39
37	4-13-4 Storage Mode	4 - 57	38
38	4-13-5 A/D Waveform Skip	4 - 59	

4-6 PREPARATION

Before making check and adjustment, prepare the following.

1. Set the ambient temperature at 23°C±5°C.
2. Set the voltage switch on the rear panel to meet the line voltage. Connect the power cord to the plug socket of the line. If the line voltage is outside the operating range of DS-6121/DS-6121A, set the voltage within the range using a voltage regulator.
3. Turn POWER switch on to supply power, adjust A INTEN to provide the proper intensity and trace, and keep the condition for about 30 minutes to warm up the machine.

4-6-1 DEFAULT Setting Procedure

Press keys in the following order to made DEFALT.

GUIDE MENU — GUIDE MENU is displayed.

↓

2 — Select SET UP RECALL/SAVE.

↓

1 — Select RECALL.

↓

7 — DEFAULT is obtained.

4-6-2 DEFAULT Setting

Operation

Write	Stop state
GP-IB	Local state
Recorder Output	Stop state
GO/NO GO Output	Stop state

Measurement Conditions

Vertical System	
COUPL	AC (for both CH 1 and CH 2)
⇕ POSITION	CH 1 1 DIV upper than midrange CH 2 1 DIV lower than midrange
VOLTS/DIV	0.1 V/DIV (for both CH 1 and CH 2)
VARIABLE	CAL (for both CH 1 and CH 2)
CH 2 POLAR	No INV
MODE	ALT
TRIGGERING	
A SOURCE	CH 1
A COUPLING	AC
A SLOPE	+
A LEVEL	+5%
Horizontal System	
MODE	AUTO
HORIZ DISPLAY	A
A TIME/DIV	1 ms/DIV
A VARIABLE	CAL
STORAGE	OFF (REAL)

4-6-3 Printed Circuit Board Locations

Printed circuit board locations are described in Figure 4-6-1 and 4-6-2 (page 4-8 to 4-11).

4-6-4 Check-points and Adjuster Locations

Check-points necessary for checks and adjustments as well as the adjuster location are described in Figure 4-7-1 to 4-7-14.

List of Figures

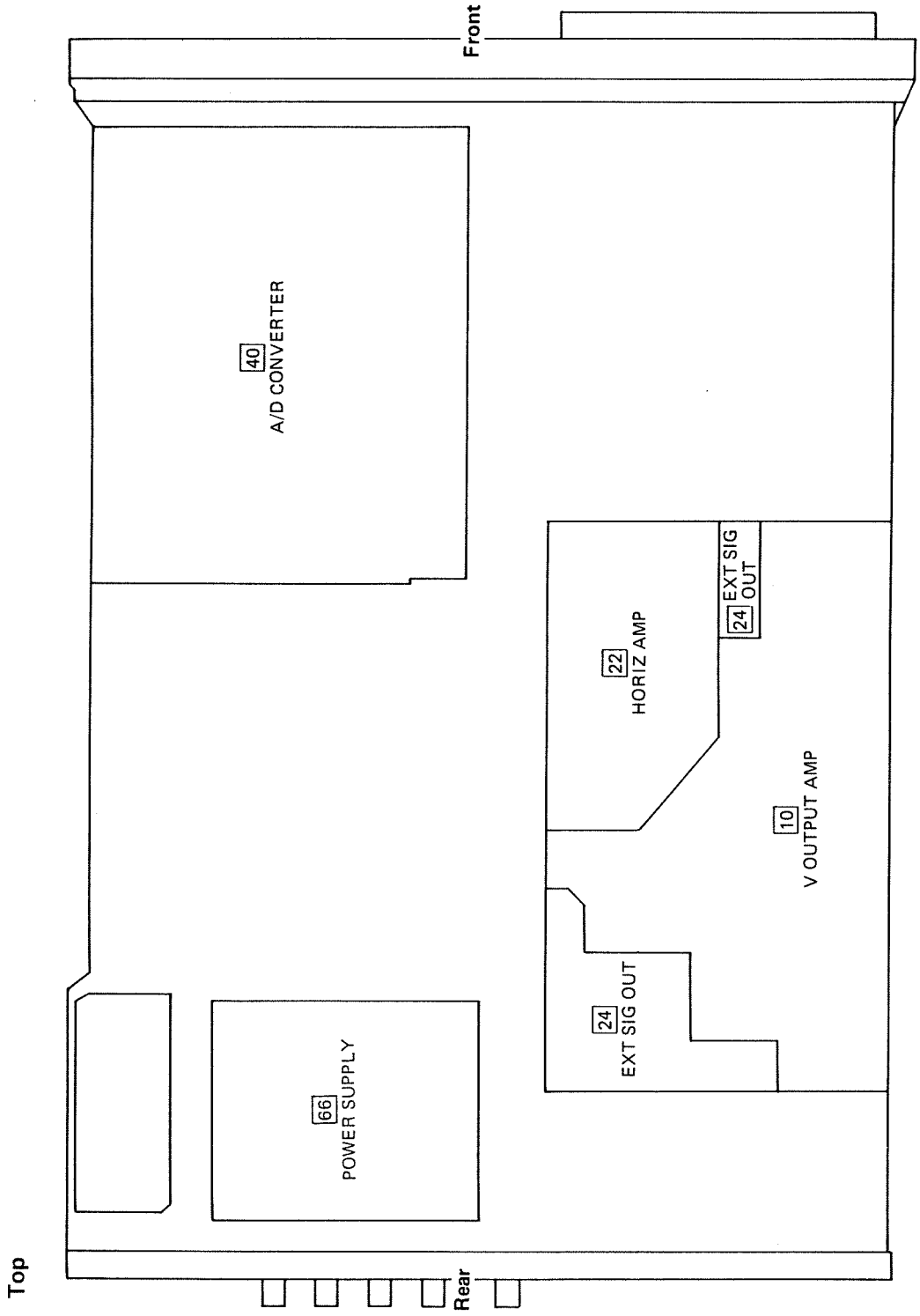
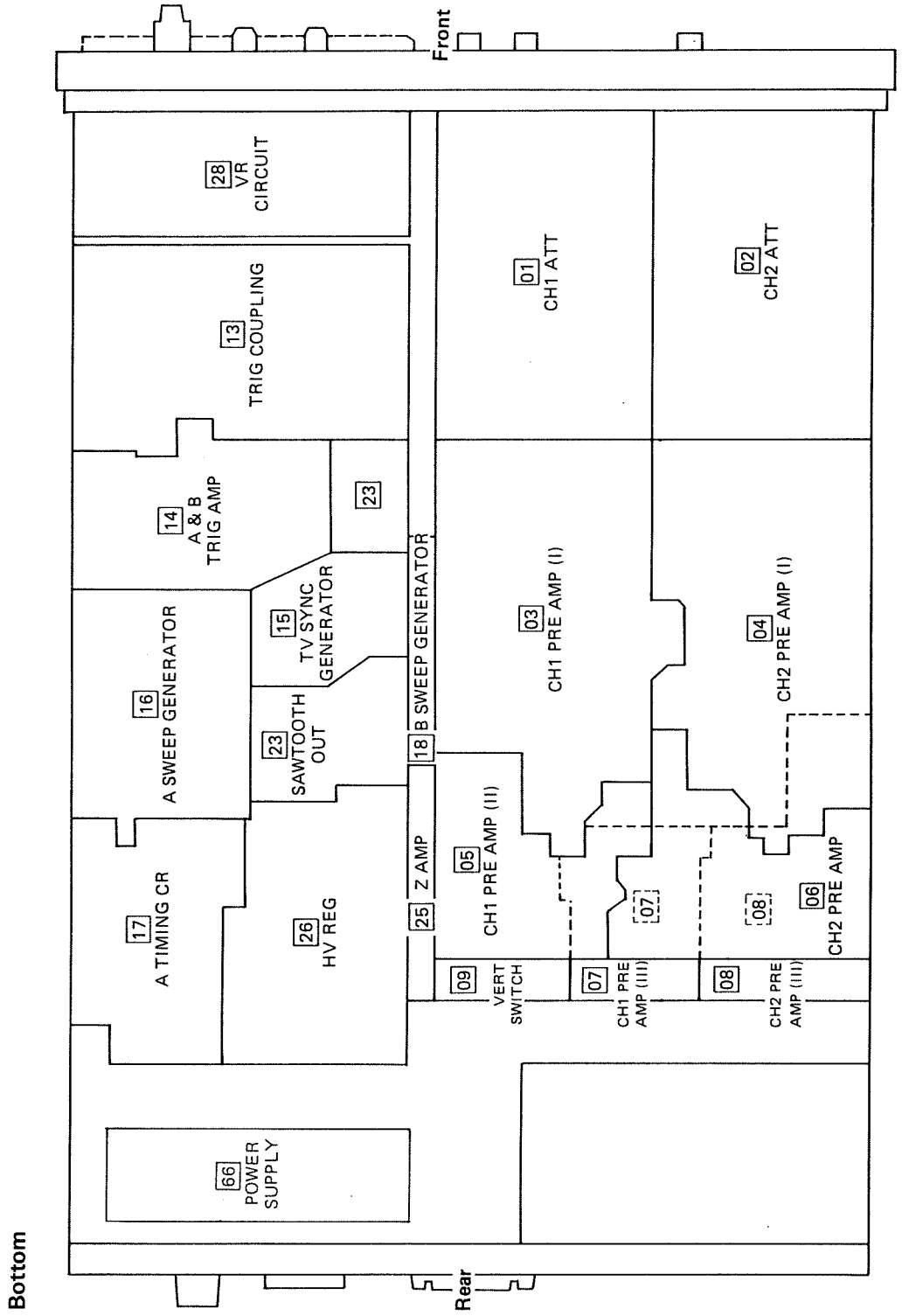


Figure 4-6-1. Printed Circuit Board Locations (I)


Front
Rear
Bottom
28 VR CIRCUIT
13 TRIG COUPLING
01 CH1 ATT
02 CH2 ATT
14 A & B TRIG AMP
23
15 TV SYNC GENERATOR
03 CH1 PRE AMP (I)
04 CH2 PRE AMP (I)
16 A SWEEP GENERATOR
23 SAWTOOTH OUT
18 B SWEEP GENERATOR
17 A TIMING CR
26 HV REG
25 Z AMP
05 CH1 PRE AMP (II)
06 CH2 PRE AMP
07
08
09 VERT SWITCH
07 CH1 PRE AMP (III)
08 CH2 PRE AMP (III)
66 POWER SUPPLY

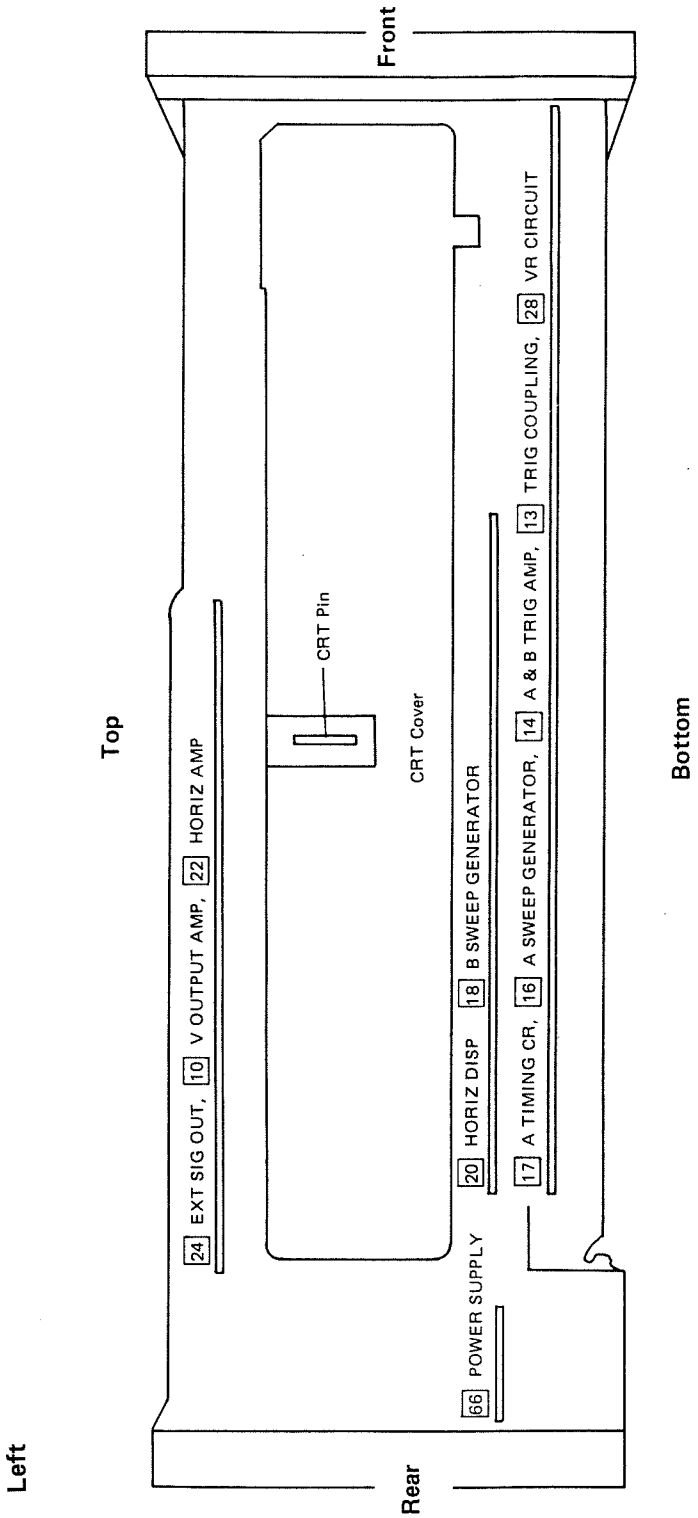
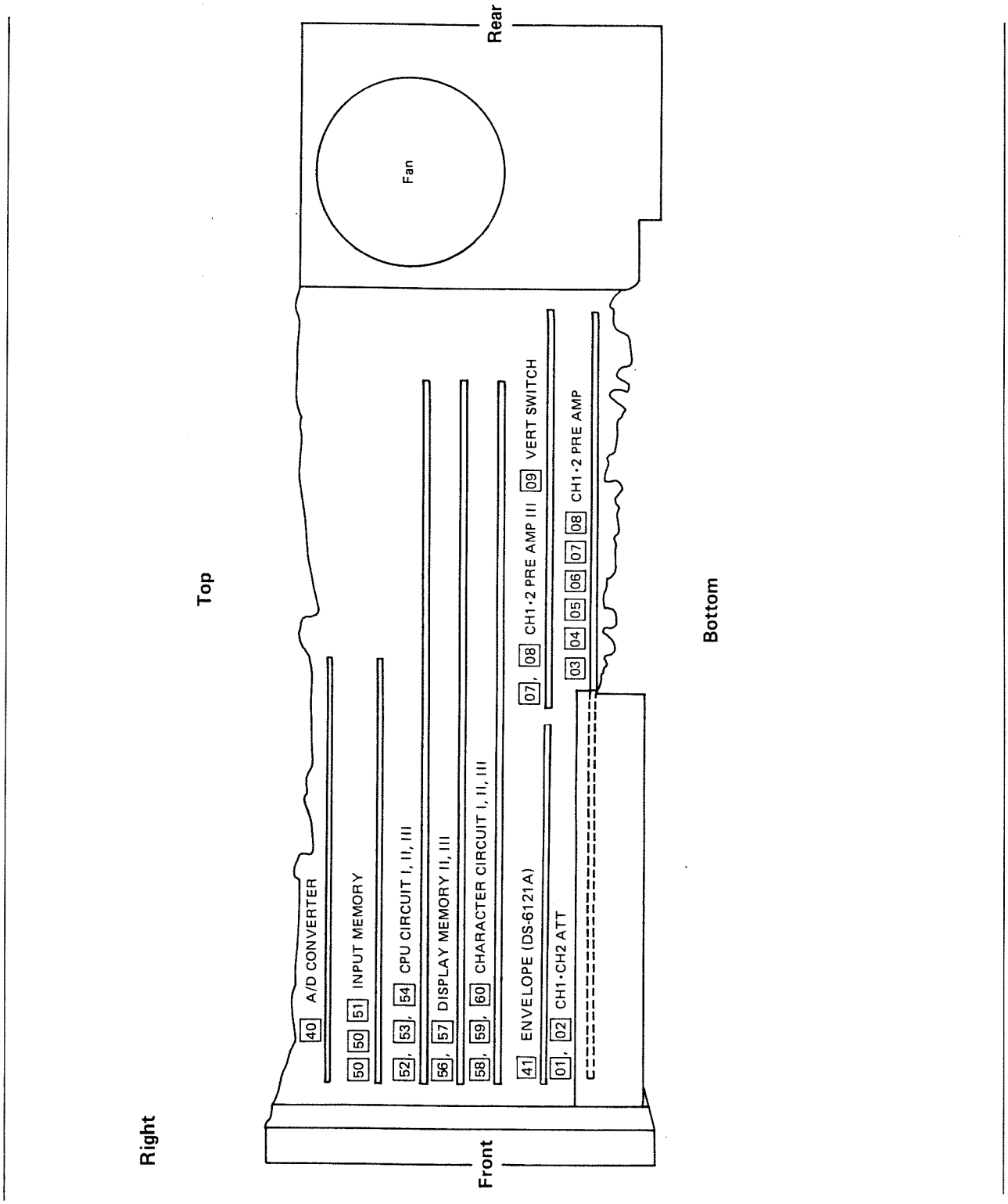


Figure 4-6-2. Printed Circuit Board Locations (II)


Top
Rear
Right
Front
Bottom
Fan
40 A/D CONVERTER
50 50 51 INPUT MEMORY
52, 53, 54 CPU CIRCUIT I, II, III
56, 57 DISPLAY MEMORY II, III
58, 59, 60 CHARACTER CIRCUIT I, II, III
41 ENVELOPE (DS-6121A)
01, 02 CH1·CH2 ATT
07, 08 CH1·2 PRE AMP III 09 VERT SWITCH
03 04 05 06 07 08 CH1·2 PRE AMP

4-7 POWER SUPPLY AND CRT

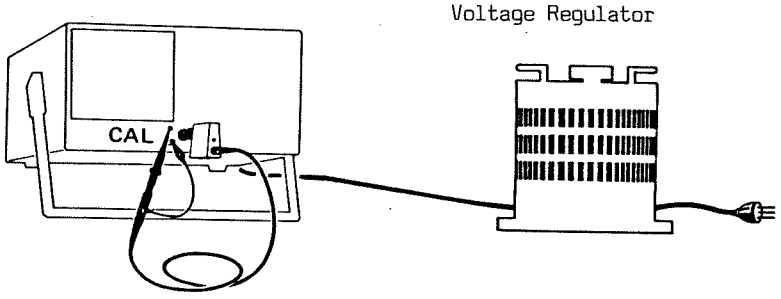
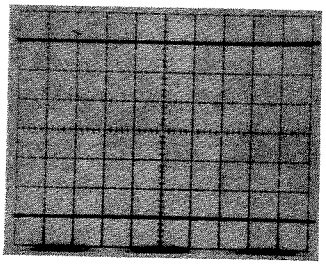
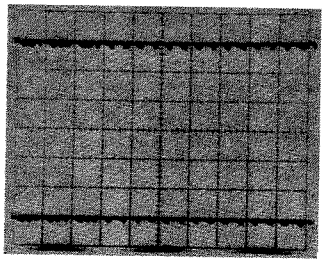
4-7-1 Power Supply

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Rating and check points</td><td>
<table>
<tr><th>Voltage</th><th>Ripple (100 VAC at loaded time)</th><th>Check Points</th></tr>
<tr><td>-12 V ± 0.12 V</td><td>MAX 3 mVp-p</td><td>P6607 Pin 2</td></tr>
<tr><td>+5 V ± 0.12 V</td><td>MAX 8 mVp-p</td><td>P6607 Pin 1</td></tr>
<tr><td>+12 V ± 0.36 V</td><td>MAX 3 mVp-p</td><td>P6607 Pin 3</td></tr>
<tr><td>+40 V ± 1.2 V</td><td>MAX 5 mVp-p</td><td>P6607 Pin 5</td></tr>
<tr><td>+130 V ± 3.9 V</td><td>MAX 100 mVp-p</td><td>P6607 Pin 6</td></tr>
<tr><td>+5.1 V ± 0.12 V</td><td>MAX 100 mVp-p</td><td>P6606 Pin 1 or 2</td></tr>
<tr><td>-5 V ± 0.2 V</td><td>MAX 15 mVp-p</td><td>P6606 Pin 8</td></tr>
</table>
</td></tr>
<tr><td>Check and adjustment</td><td>
——— DC level ———
1. Check the voltage across the check points and the ground, using a digital multimeter.
2. If the voltage is outside the rated value, adjust "-12 V" with VR6601 -12V ADJ.
3. Check voltages at other locations again.

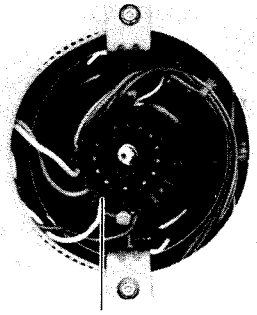
<Note>
The design is such that by adjusting -12 V, other voltages can be set within the specification range.

——— Ripple Voltage ———
4. Set the sweep MODE to SINGLE.
5. Connect 1 : 1 probe with a test oscilloscope and check the ripple voltages of each power supply.
</td></tr>
<tr><td>Check points and adjuster locations</td><td>P6607, P6606 and VR6601 (Figure 4-7-1)</td></tr>
</table>

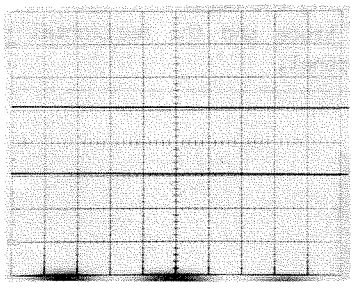
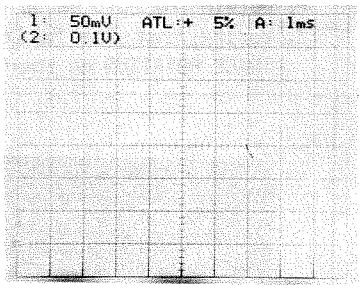
4-7-2 AC Voltage Range

Item	Description
Rating	90 V to 250 V
Connection	DS-6121/DS-6121A Voltage Regulator 
Setting	A TIME/DIV : 10 ms
Check and adjustment	Using a voltage regulator, change the supply voltage level continuously and check that ripple or intensity modulation does not appear on the CRT waveform.
CRT waveform	Normal Waveform  Abnormal Waveform  Input Signal : Calibration Voltage

4-7-3 CRT Cathode Voltage

Item	Description
Rating	-2450 V ±5%
Check and adjustment	1. Using a digital multimeter (with a high-voltage probe), measure the voltage either between the CRT socket pin 2 and the ground or between D2604 cathode and the ground. 2. If the result is outside the rated value, adjust the voltage with **R2626 HV ADJ** . **CAUTION** *If the error of the CRT cathode voltage is within ±5%, do not made adjustment, except when all items are adjusted.*
Cathode Pin 2 position	Rear View  CRT Pin 2
Adjuster location	R2626 (Figure 4-7-2)

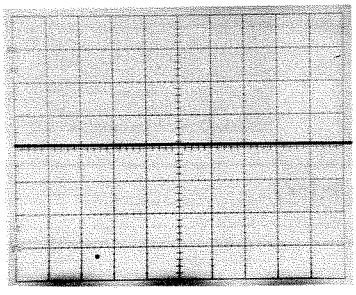
4-7-4 Intensity

Item	Description
Rating	The trace and the character are extinguished when A and CHARACTER INTEN control are turned fully counterclockwise.
Setting	DEFAULT ENHANCE : OFF
Check and adjustment	——— **INTEN LEVEL** ——— 1. Turn CHARACTER INTEN fully counterclockwise and A INTEN fully clockwise. 2. Adjust with **R2561 INTEN LEVEL** so that Z AMP output waveform can be +80 V at maximum using the test oscilloscope. ——— **INTEN ADJ** ——— 3. Adjust with A INTEN so that the Z AMP output waveform can be +40 V using the test oscilloscope. 4. Adjust with **R2603 INTEN ADJ** so that the trace can appear faintly. ——— **CHARA INTEN** ——— 5. Set CHARACTER INTEN to the midrange. 6. Adjust with **R2516 CHARA INTEN** so that the character can appear faintly. 7. Verify that flickering of the trace disappears by turning CHARACTER INTEN fully counterclockwise. ——— **C2506** ——— 8. Set the sweep time to 20 ns/div. 9. Adjust with **C2506** in order to obtain the better uniformity in intensity.
CRT waveform	A INTEN ADJ Adjustment  CHARA INTEN Adjustment 
Adjuster locations	R2561, R2603, R2516, C2506 (Figure 4-7-2)

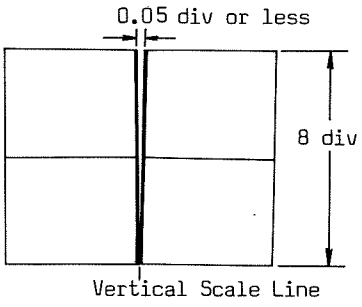
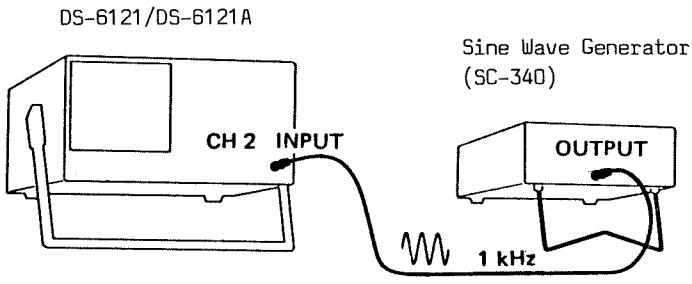
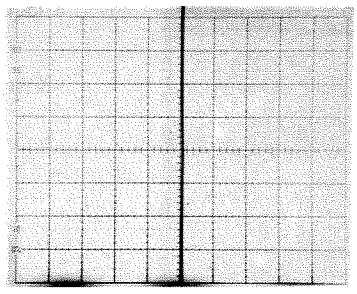
4-7-5 Focus

Item	Description
Rating	Adjust to minimize the effect on focus by turning A INTEN. Adjust focus to the best setting within 60° of midrange.
Setting	DEFAULT A and CHARACTER INTEN : Slightly visible FOCUS : Midrange
Check and adjustment	1. Adjust with FOCUS, ASTIG, **R2491 FOCUS 1** and **R2607 FOCUS 2** so that the optimum focus for CHARACTER can obtain. 2. Adjust with **R2602 AUTO FOCUS** to minimize the effect on focus when intensity is increased by turning INTEN.
Adjuster locations	R2491 (Figure 4-7-3) R2607 and R2602 (Figure 4-7-2)

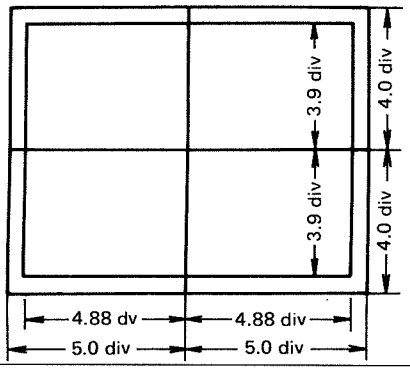
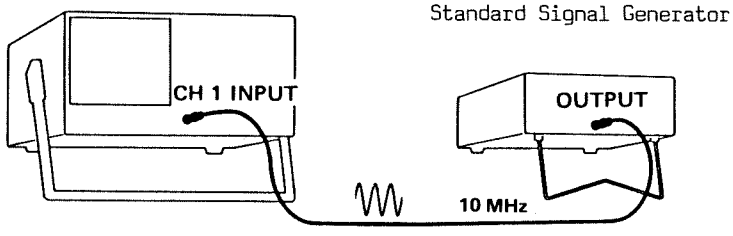
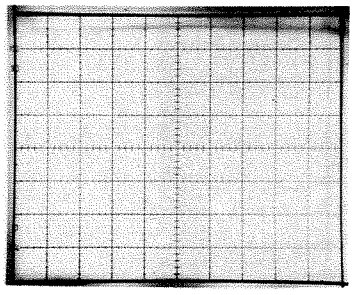
4-7-6 The Parallel of the Horizontal Trace and the Horizontal Scale (TRACE ROTATION)

Item	Description
Rating	The horizontal trace and the central horizontal scale line should meet each other.
Check and adjustment	1. Obtain the AUTO sweep by setting the horizontal MODE to AUTO under no signal. 2. Verify that the horizontal trace and the horizontal scale line meet by turning TRACE ROTATION on the front panel.
CRT waveform	

4-7-7 The Parallel of the Vertical Trace and the Vertical Scale (ORTHOGONALITY)

Item	Description
Rating	Difference between the vertical trace and the central vertical scale line should be less than 0.05 div/8 div. 
Connection	
Setting	HORIZ DISPLAY : X-Y
Check and adjustment	Adjust with **R2492 ORTHOGONALITY** the difference between the vertical trace and the central vertical scale line.
CRT waveform	
Adjuster location	R2492 (Figure 4-7-3)

4-7-8 Pattern Distortion

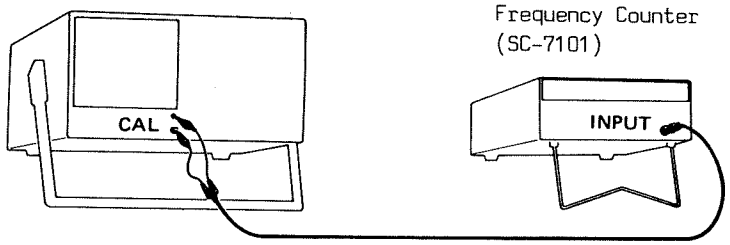
Item	Description
Rating	Should be within the range shown in the figure at the right. 
Connection	DS-6121/DS-6121A 
Setting	HORIZ DISPLAY : A A TIME/DIV : 1 m sec
Check and adjustment	1. Check the horizontal deflection on the top and bottom of the scale. 2. Check the vertical deflection on the left and the right end of the scale. 3. If the result is outside the rating, adjust with **R2490 PATTERN.**
CRT waveform	 Input Signal : Sine Wave 10 MHz <Note> Left side picture is photographed with four times exposure.
Adjuster location	R2490 (Figure 4-7-3)

4-8 CALIBRATOR OUTPUT

4-8-1 Output Voltage

Item	Description
Rating	+0.6 V ± 1%
Check and adjustment	1. Plug out **J2801** from **P2801.** 2. Adjust CAL (calibration voltage output terminal) voltage with **R2806 CAL ADJ.**
Connector and adjuster locations	J2801 and R2806 (Figure 4-7-4)

4-8-2 Repetition Rate

Item	Description
Rating	1 kHz ± 1%
Connection	DS-6121/DS-6121A 
Check and adjustment	1. Plug **J2801** into **P2801.** 2. Check CAL (calibration voltage output terminal) frequency with a counter.
Connector location	J2801 (Figure 4-7-4)

4-9 VERTICAL DEFLECTION SYSTEM

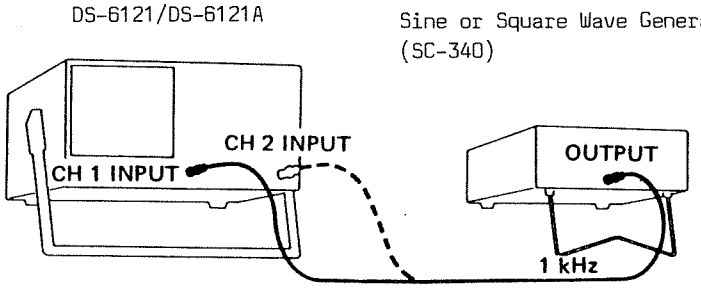
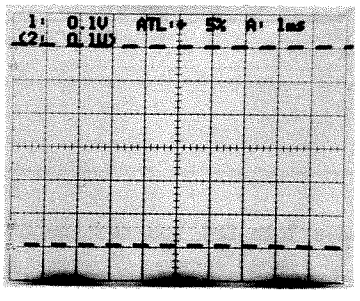
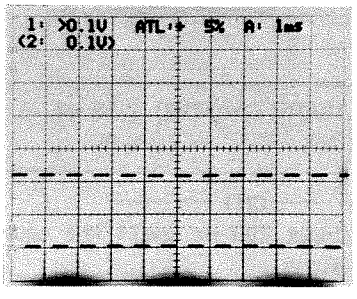
4-9-1 Preparation

Before adjusting the vertical axis, turn the following adjusters fully clockwise.
R0365 CH1 VAR START (Figure 4-7-5)
R3666 CH1 VAR MIN (Figure 4-7-5)
R0465 CH2 VAR START (Figure 4-7-5)
R0466 CH2 VAR MIN (Figure 4-7-5)

4-9-2 Vertical Balance

Item	Description
Check and adjustment	——— **STEP ATT BAL** ——— Adjust with **R0125 STEP ATT BAL (CH1)** and **R0225 STEP ATT BAL (CH2)** so that the trace does not move when 5 V and 10 mV are switched over. ——— **5 mV BAL** ——— Adjust with **R0306 5 mV BAL (CH1)** and **R0406 5 mV BAL (CH2)** so that the trace does not move when 10 mV and 5 mV are switched over. ——— **2 mV BAL** ——— Adjust with **R0382 2 mV BAL (CH1)** and **R0482 2 mV BAL (CH2)** so that the trace does not move when 5 mV and 2 mV are switched over. **CAUTION** *Adjustments should be done repeatedly, since 5 mV and 2 mV affect each other.*
Adjuster locations	R0125, R0225, R0306, R0406, R0382 and R0482 (Figure 4-7-5)

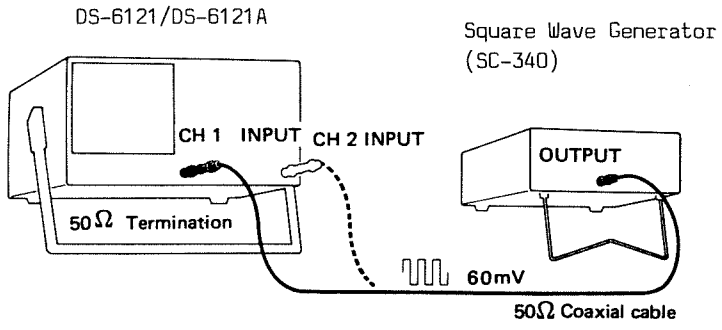
4-9-3 Variable Reduction Rate

Item	Description
Rating	1/2.5 or less
Connection	
Check and adjustment	——— **CH2 VAR MIN** ——— 1. Set the amplitude to 6 div at the center of the CRT screen. 2. Adjust with amplitude to approximately 2.2 div with **R0366 VAR MIN (CH1)** when VARIABLE is set to the minimum. ——— **CH1 VAR START** ——— 3. Return VARIABLE to CAL position. 4. Adjust with **R0365 VAR START (CH1)** so that the reduction starts at the 15th count from the CAL position. ——— **CH2 VAR MIN and VAR START** ——— 5. Adjust also CH2 with **R0466 VAR MIN (CH2)** and **R0465 VAR START (CH2).**
CRT waveform	1) Set to 6 div  2) Set variable to minimum  Input Signal : Square Wave 1 kHz
Adjuster locations	R0366, R0365, R0446 and R0465 (Figure 4-7-5)

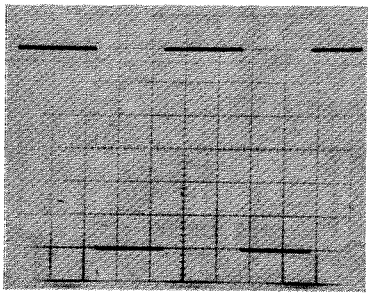
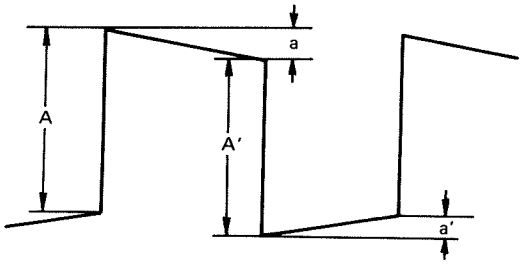
4-9-4 Variable Balance

Item	Description
Setting	CH1•CH2 COUPL : GND
Check and adjustment	1. Adjust with **R0504 VAR BAL (CH2)** so that the trace move is minimized when CH1 VARIABLE is turned. 2. Adjust also CH2 with **R0603 VAR BAL (CH2).**
Adjuster locations	R0504 and R0603 (Figure 4-7-5)

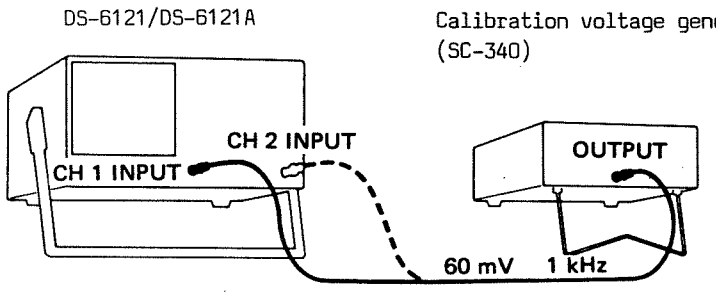
4-9-5 Square Wave Characteristics I (Low Frequency)

Item	Description
Rating	Sag 1% (10 mV range)
Connection	
Setting	VOLTS/DIV (CH1•CH2) : 10 mV V COUPL : DC
Check and adjustment	——— **CH1** ——— 1. Input 100 Hz and 1 kHz square wave into CH1 and set the CRT amplitude to 6 divisions. 2. Adjust the waveform with **C0118** and **R0377 CH1 10 mV LF COMP.** 3. Set the square wave frequency to 10 kHz and 100 kHz, and adjust with **R0341, R0342, R0345** and **R1029.** 4. Set the square frequency to 100 kHz and adjust with **R1003** so that no level difference occurs around 200 ns from the rise. ——— **CH2** ——— 5. Input 1 kHz square wave into CH2 and adjust with **C0218** and **R0477 CH2 10 mV LF COMP** same as **CH1.** 6. Set the square wave frequency to 10 kHz and 100 kHz, and adjust with **R0441, R0442,** and **R0445.**

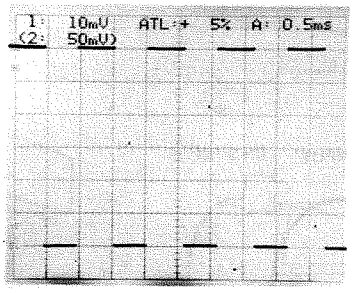
4-9-5 Square Wave Characteristics I (Low Frequency))(Cont.)

Item	Description
CRT waveform	 Input Signal : Square Wave 1 kHz 60 mV
Reference	 Sag = $\frac{a}{A}$ (or $\frac{a'}{A'}$) × 100% The larger of $\frac{a}{A}$ or $\frac{a'}{A'}$ is taken. (Electronic Machinery Industry Association MEA-27)
Adjuster locations	C0118, C0218, R0377, R0341, R0342, R0345, R0477, R0441, R0442 and R0445 (Figure 4-7-6) R1003 and R1029 (Figure 4-7-7)

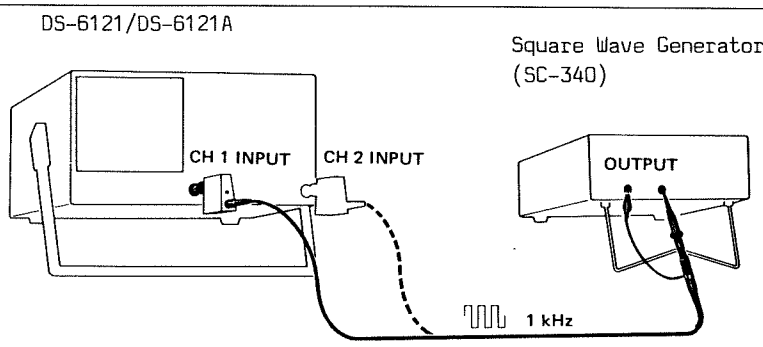
4-9-6 Gain

Item	Description
Rating	1 mV/div, 2 mV/div 4% 5 mV/div to 5 V/div 2%
Connection	
Check and adjustment	**10 mV/div** 1. Set the output of a calibration voltage generator to 60 mV. 2. Adjust the CRT amplitude to 6 div with **R7016 CH1 GAIN** and **R0816 CH2 GAIN.** **5 mV/div** 3. Set the output of a calibration voltage generator to 30 mV. 4. Adjust flatness of the waveform with **R0315 5 mV LF COMP (CH1)** and **R0415 5 mV LF COMP (CH2).** **2 mV/div, 1 mV/div** 5. Set the output of a calibration voltage generator to 12 mV. 6. Adjust the CRT amplitude to 6 div with **R0353 2 mV GAIN (CH1)** and **R0453 2 mV GAIN (CH2).** 7. Adjust the output of a calibration voltage generator and check 20 mV to 5 V gain. **CAUTION** *The design is such that by adjusting 10 mV/div and 2 mV/div, other ranges beyond 20 mV/div can be set within the specification range.*
Adjuster locations	R0716, R0816, R0315, R0415, R0353 and R0453 (Figure 4-7-5)

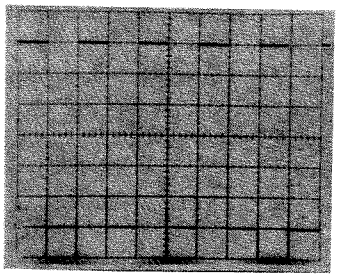
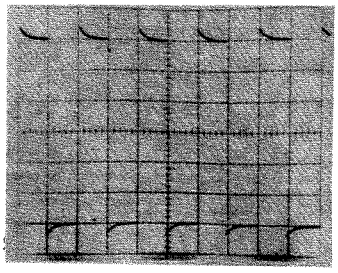
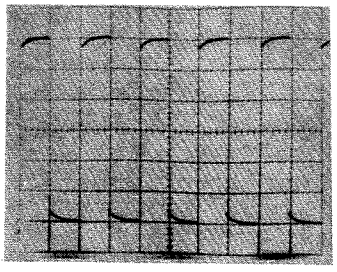
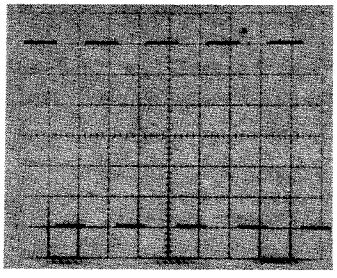
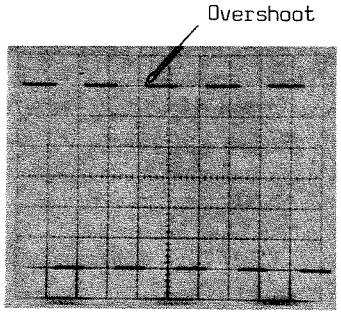
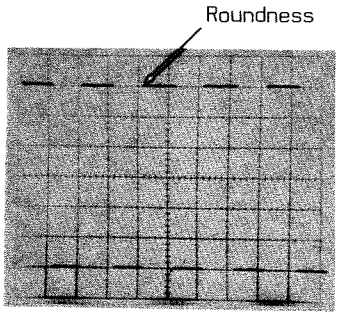
4-9-6 Gain (Cont.)

Item	Description
CRT waveform	 Input Signal : Square Wave 1 kHz

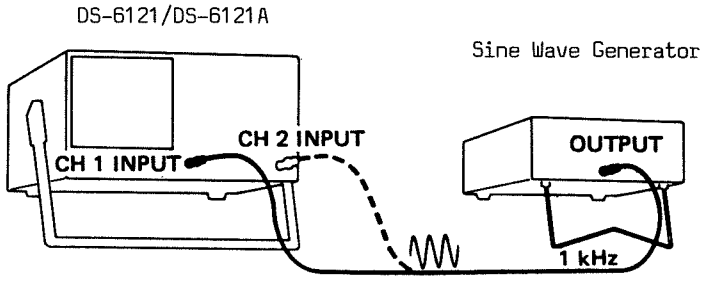
4-9-7 Attenuator Compensation

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Rating</td><td>1.5%</td></tr>
<tr><td>Connection</td><td>DS-6121/DS-6121A
 
</td></tr>
<tr><td>Check and adjustment</td><td>1. Setting to 10 mV, adjust the attenuator compensation with a probe.
2. Adjust the output of a square wave generator and adjust the compensation of 0.1 V/div and 1 V/div according to the table below.
<table>
<tr><th rowspan="2">VOLTS/DIV</th><th colspan="2">CH1</th><th colspan="2">CH2</th></tr>
<tr><th>Attenuator</th><th>Probe</th><th>Attenuator</th><th>Probe</th></tr>
<tr><td>0.1 V</td><td>C0108</td><td>C0109</td><td>C0208</td><td>C0209</td></tr>
<tr><td>1 V</td><td>C0103</td><td>C0104</td><td>C0203</td><td>C0204</td></tr>
</table>
CAUTION
1 V/div should be adjusted after adjusting 0.1 V/div.</td></tr>
<tr><td>Adjuster locations</td><td>C0108, C0109, C0103, C0104, C0208, C0209, C0203 and C0204 (Figure 4-7-5)</td></tr>
</table>

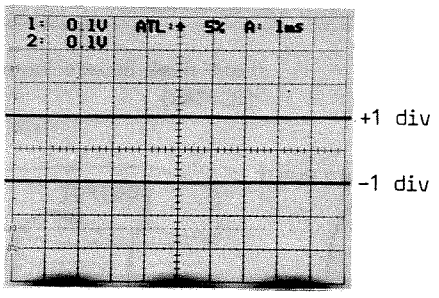
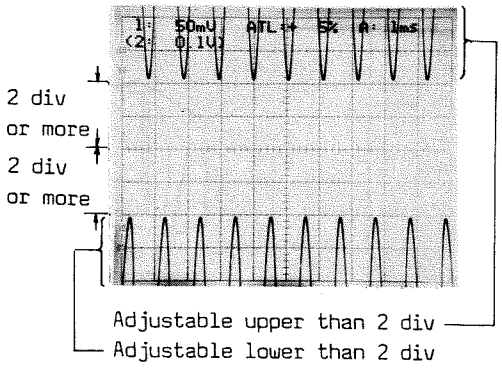
4-9-7 Attenuator Compensation (Cont.)

Item	Description
CRT waveform	Probe Compensation (input signal : 1 kHz)  (a) Proper  (b) Improper (overcompensation)  (c) Improper (undercompensation)
	Attenuator Compensation (input signal : 1 kHz)  (a) Proper  (b) Improper (overcompensation)  (c) Improper (undercompensation)

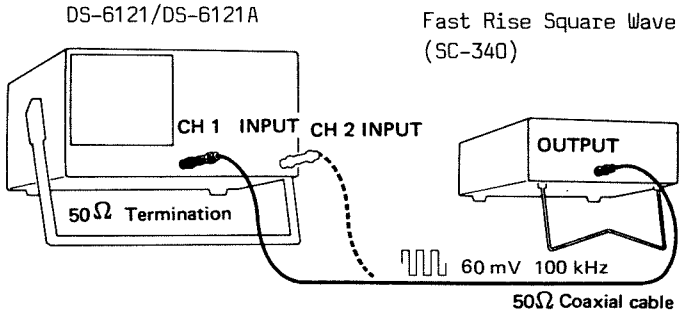
4-9-8 Position Center, Variable Range and Polarity Center

Item	Description
Rating	Position center : Center +1 ± 0.4 div Variable range : ±8 div or more
Connection	
Check and adjustment	——— **CH1** ——— 1. Set to DEFAULT. 2. Adjust with **R0517 CH1 POS CENT** to position, CH1 trace at 1 div upper than the center line of the CRT screen. 2. Input 1 kHz sine wave at 0.1 V/div and set the amplitude to 8 div. 4. Set to 50 mV/div and adjust CH1 variable range to approximately 10 div with **R0509 CH1 POS GAIN.** ——— **POLA CENT** ——— 5. Reset to DEFAULT. 6. Adjust with **R0617 POLA CENT** so that it moves 2 div to upward when CH2 POLAR is switched over to INV. ——— **CH2** ——— 7. Adjust with **R0821 CH2 POS CENT** to position CH2 trace at 1 div lower than the center line of the CRT screen. 8. Adjust CH2 variable range to approximately ±10 div **R0609 CH2 POS GAIN.**
Adjuster locations	R0517, R0509, R0617 and R0609 (Figure 4-7-5) R0821 (Figure 4-7-8)

4-9-8 Position Center, Variable Range and Polarity Center (Cont.)

Item	Description
CRT waveform	1) POS CENT  2) POS GAIN 

4-9-9 Square Wave Characteristics II (High Frequency)

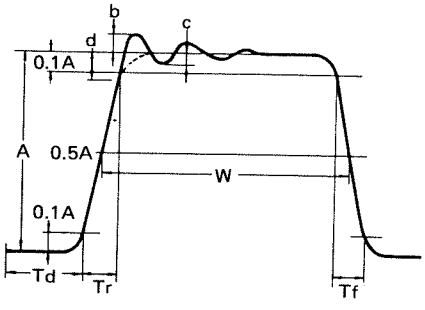
Item	Description
Rating	Overshoot : 3% (at 10 mV/div) Other distortion : 3% (at 10 mV/div)
Connection	
Setting	Fast rise square wave generator (input signal) : 100 kHz
Check and adjustment	**10 mV/div** 1. Adjust the generator output and set the amplitude to 6 divisions. 2. Adjust the waveform with below-mentioned adjusters.

CH1		CH2	
R1029			
R0346	C0311	R0446	C0411
R1030	C1014		
	C0302		C0402

CAUTION

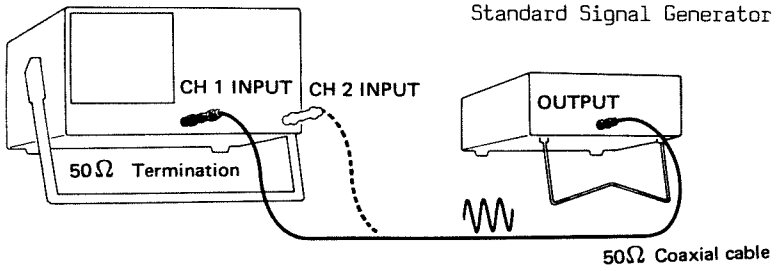
Square wave adjustment upon equivalent sampling is made easier by adjusting capacities of C0311 and C0411 to be smaller and the resistance value of R1029 to be also smaller.

4-9-9 Square Wave Characteristics II (High Frequency) (Cont.)

<table>
<tr><td>Item</td><td>Description</td></tr>
<tr><td>Check and adjustment</td><td>3. Adjust waveform in the following ranges by adjusting the outputs of a generator.
<table>
<tr><th>VOLTS/DIV</th><th>CH1</th><th>CH2</th></tr>
<tr><td>5 mV</td><td>C0303</td><td>C0403</td></tr>
<tr><td>2 mV</td><td>R0357, R0355
R0354, C0318</td><td>R0454, R0455
R0457, C0418</td></tr>
<tr><td>0.1 V</td><td>R0113</td><td>R0213</td></tr>
<tr><td>1 V</td><td>R0107</td><td>R0207</td></tr>
</table>
4. Check the waveforms for each range from 1 mV/div to 5 V/div.</td></tr>
<tr><td>Reference</td><td> 

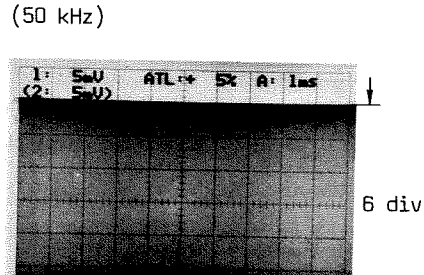
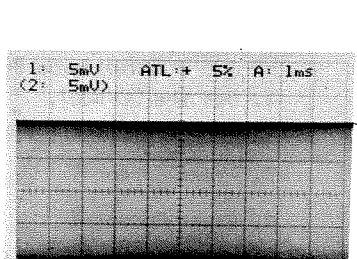
A : Standard Amplitude Tr : Rise Time
$\frac{b}{A}$: Overshoot Tf : Fall Time
$\frac{c}{A}$: Ringing $\frac{d}{A}$: Roundness
W : Pulse Width Td : Signal Delay Time</td></tr>
<tr><td>Adjuster locations</td><td>R1029, R1030 and C1014 (Figure 4-7-7)
Figure 4-7-6 for the other than the above-mentioned.</td></tr>
</table>

4-9-10 Bandwidth

Item	Description
Rating	5 mV/div to 2 V/div DC to 100 MHz -3 dB 5 V/div DC to 100 MHz -3.5 dB 1 mV and 2 mV/div DC to 50 MHz -3 dB
Connection	DS-6121/DS-6121A 
Check and adjustment	1. Set the reference frequency to 50 kHz and adjust the signal generator so that the amplitude swings 6 divisions. 2. Then, change the frequency corresponding to each rating, and read the amplitude to check whether it is within the rating.
Reference	Decibel conversion table when the reference amplitude is set to 6 divisions.

Amplitude (div)	6.0	4.4	4.3	4.25	4.2	4.1	4.0
Decibel (dB)	0	-2.7	-2.9	-3.0	-3.1	-3.3	-3.5

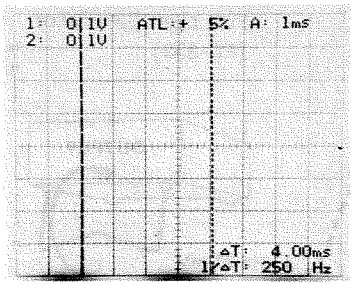
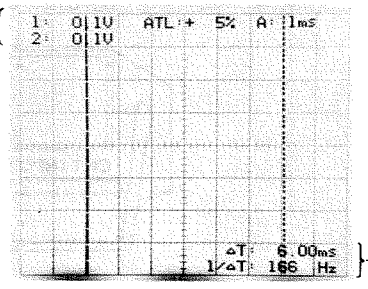
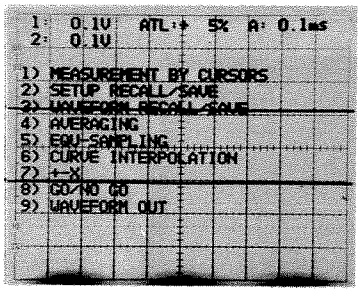
4-9-10 Bandwidth (Cont.)

Item	Description
CRT waveform	Reference Frequency (50 kHz)  6 div Rating Frequency  4.25 div or more

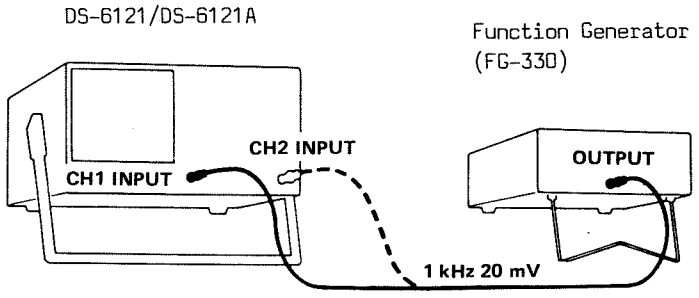
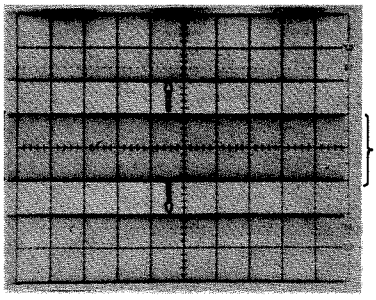
4-9-11 Initial Position of Cursor and Character

Item	Description
Rating	Cursor 1 At the center of the CRT screen -1 div ± 0.3 div Cursor 2 At the center of the CRT screen +1 div ± 0.3 div
Check and adjustment	**Cursor Initial Position** 1. Set the DEFAULT. 2. Extinguish the sweep trace with A INTEN and leave only the character cursor. 3. Press Cursor 1 and set the read value to 400 mV. 4. Press Cursor 2 and set the read value to 600 mV. 5. Adjust with **R1094 SCOPE Y POS** and **R10102 SCOPE Y GAIN** so that the Cursor 1 and 2 come ±3 div on the center of the CRT screen. **Character Position** 6. Adjust with **R5895 CHARA POS** and **R5896 CHARA GAIN** so that the character position gets as CRT waveform. 7. Adjust the horizontal positioning and the size of a character appropriately with **R2271 CHARA POS** and **R2262 CHARA GAIN.** (Fine adjustment should be done on X-axis adjustment.) **Stable Characters** 8. Display the sweep trace with A INTEN and set the CH1 trace to a position being a little higher than the upper 1 div and set the CH2 trace to a position being a little lower than the lower 1 div. 9. Set the sweep time to 0.1 ms/div. 10. Press GUIDE MENU to display many characters and adjust with **R1049** so that the vertical unstability of a character is minimized.
Adjuster locations	R1094, R10102 and R1049 (Figure 4-7-7) R5895 and R5896 (Figure 4-7-8) R2271 and R2262 (Figure 4-7-9)

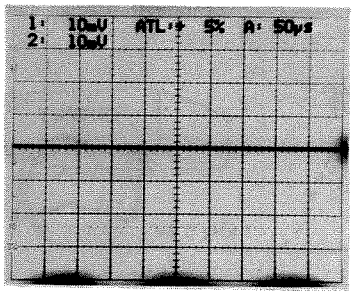
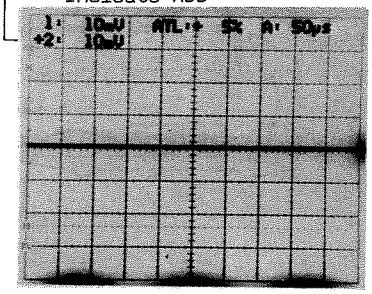
4-9-11 Initial Position of Cursor and Character (Cont.)

Item	Description
CRT waveform	1) Cursor 1 Adjustment  2) Cursor 2 and Character Position Adjustments  The top 2 lines enter this scale The bottom 2 lines enter this scale 3) Stable Characters Adjustment 

4-9-12 Linearity

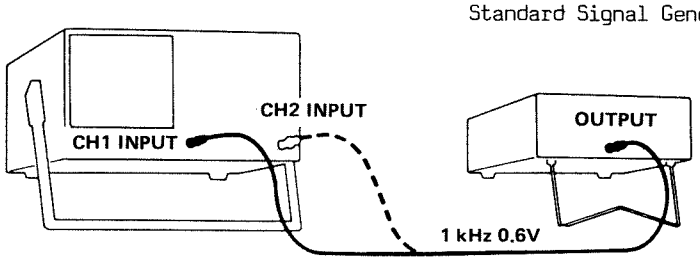
Item	Description
Rating	±3% (at 1 kHz)
Connection	
Setting	CH1•CH2 VOLTS/DIV : 10 mV
Check and adjustment	1. Set the amplitude to 2 div at the center of the screen. 2. Check that the amplitude change is within 3%, by shifting the waveform to the top line and to the bottom line with POSITION ⇦ ⇨ .
CRT waveform	The Top Line The Center Line The Bottom Line  2 div Input Signal : Sine Wave 1 kHz

4-9-13 ADD Balance

Item	Description
Rating	Positional movement : 1 div or less
Setting	INPUT (CH1•CH2) : GND VOLTS/DIV (CH1•CH2) : 10 mV/div V. MODE : ALT
Check and adjustment	1. Position both CH1•CH2 traces to the center of CRT screen. 2. Adjust with **R0951 ADD BAL** so that the trace does not move when V. MODE is switched over to ADD.
CRT waveform	1) At ALT  2) At ADD Indicate ADD 
Adjuster location	R0951 (Figure 4-7-5)

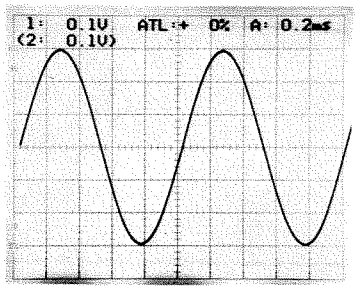
4-10 TRIGGERING

4-10-1 A Trigger

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Rating</td><td>The minimum triggering level
<table>
<tr><th>Frequency Range</th><th>Internal</th><th>External</th></tr>
<tr><td>DC to 10 MHz</td><td>0.4 div</td><td rowspan="3">0.1 V</td></tr>
<tr><td>10 MHz to 50 MHz</td><td>1.0 div</td></tr>
<tr><td>50 MHz to 100 MHz</td><td>1.5 div</td></tr>
</table></td></tr>
<tr><td>Connection</td><td>DS-6121/DS-6121A
Sine Wave Generator or
Standard Signal Generator
 
</td></tr>
<tr><td>Setting</td><td>HORIZ DISPLAY : A
MODE : CH1
CH1 VOLTS/DIV : 0.1 V
CH2 VOLTS/DIV : 0.1 V
A SLOPE : +
A COUPLING : AC
A SOURCE : CH1
A LEVEL : 0%

Signal generator (input signal) : Sine 1 kHz</td></tr>
<tr><td>Check and adjustment</td><td>———— A TRIG LEVEL ————
1. Input 1 kHz sine wave and set the CRT amplitude to 6 divisions.
2. Adjust with R1402 A TRIG LEVEL to trigger at the center of the CRT screen.
———— CH1 A TRIG DC ————
3. Set A COUPLING to DC.
4. Adjust with R0546 CH1 A TRIG to trigger at the center of the CRT screen.
———— CH2 A TRIG DC ————
5. Set V. MODE and A SOURCE to CH2.
6. Adjust with R0646 CH2 A TRIG DC to trigger at the center of the CRT screen.</td></tr>
</table>

4-10-1 A Trigger (Cont.)

Item	Description
Check and adjustment	————**NORM TRIG DC**———— 7. Set A SOURCE to NORM. 8. Adjust with **R0946 NORM TRIG DC** to trigger at the center of the CRT screen. ————**A EXT TRIG DC**———— 9. Set A SOURCE to EXT. 10. Input into EXT TRIG INPUT the same sine wave as was input into CH2, using signal T. 11. Adjust with **R1358 A EXT ADJ** to trigger at the center of the CRT screen.
CRT waveform	—— **Level Adjustment** ——  Input Signal : Sine Wave 1 kHz 0.6 V
Adjuster locations	R1402, R0546, R0646 and R1358 (Figure 4-7-10) R0946 (Figure 4-7-8)

4-10-2 B Trigger

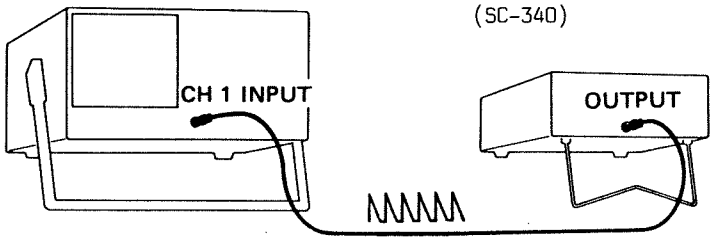
Item	Description
Rating	Same as A trigger
Connection	Same as A trigger
Setting	HORIZ DISPLAY : A INTEN V. MODE : CH1 CH1 VOLTS/DIV : 0.1 V CH2 VOLTS/DIV : 0.1 V A SLOPE : + A COUPLING : AC A SOURCE : CH1 A LEVEL : 0% A TIME/DIV : 0.2 ms B SLOPE : + B COUPLING : AC B SOURCE : CH1 B LEVEL : 0% B TIME/DIV : 0.1 ms
Check and adjustment	——— **B TRIG LEVEL** ——— 1. Input 1 kHz sine wave and set the CRT amplitude to 6 divisions. 2. Adjust with **R1412 B TRIG LEVEL** to trigger at the center of the CRT screen. ——— **B CH1 DC** ——— 3. Set B COUPLING to DC. 4. Adjust with **R1375 B CH1 ADJ** to trigger at the center of CRT screen. ——— **B CH2 DC** ——— 5. Set as follows: V. MODE : CH2 A SOURCE : CH2 B SOURCE : CH2 6. Adjust with **R1374 B CH2 ADJ** to trigger at the center of the CRT screen. ——— **B EXT TRIG DC** ——— 7. Set B SOURCE to EXT. 8. Input into EXT TRIG INPUT the sine wave same as CH2 input, using signal T. 9. Adjust with **R1365 B EXT ADJ** to trigger at the center of the CRT screen.
CRT waveform	Refer to 4-10-1.
Adjuster locations	R1412, R1375, R1374 and R1365 (Figure 4-7-10)

4-11 HORIZONTAL DEFLECTION SYSTEM

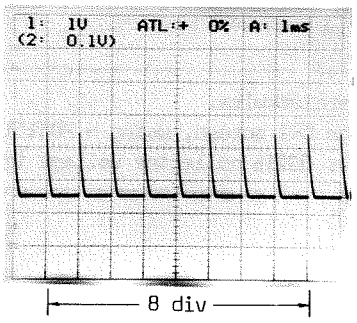
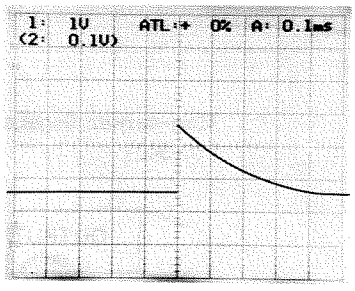
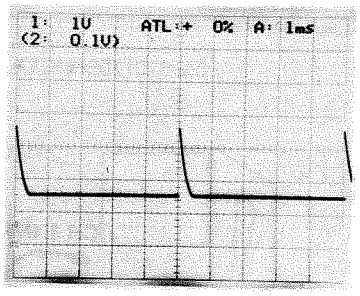
4-11-1 Average Voltage of Horizontal Amplifier

Item	Description
Setting	HORIZ DISPLAY : X-Y
Check and adjustment	1. Turn CHARACTER INTEN fully counterclockwise. 2. Set the trace at the center of the CRT screen, using H POSITION. 3. Adjust with **R2227** so that **Q2212** or **Q2215** collector voltage is set to +65 V.
Adjuster locations	Q2212, Q2215 and R2227 (Figure 4-7-9)

4-11-2 Sweep Time

Item	Description
Rating	The sweep accuracy ×1 (the center of screen 8 division) 20 ns to 0.1 s 2% (+10°C to +35°C) The sweep accuracy at ×10 (the center of screen 8 division excluding start 30 ns and stop 40 ns) 0.1 ns to 0.1 s 3% (+10°C to +85°C) 20 ns to 50 ns 6% (+10°C to +35°C)
Connection	DS-6121/DS-6121A Time-marker Generator (SC-340) 

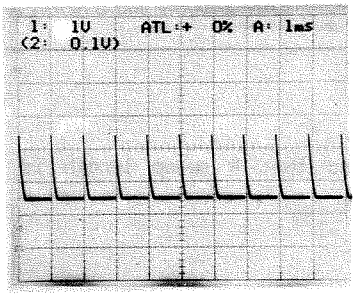
4-11-2 Sweep Time (Cont.)

Item	Description
Check and adjustment	**A Sweep 1 ms/div** 1. Adjust the sweep time over center 8 div on CRT with **R2210 SWP CAL.**  Input Signal : Time Marker 1 ms **A Sweep 10 μs/div** 2. Adjust the sweep time over center 8 div on the CRT with **C1608.** **MAG CENT** 3. Set as follows: A TIME/DIV : 1 ms/div MAX ×10 : ON TIME MARKER (input signal) : 5 ms 4. Adjust 2nd pulse peak to the center of the CRT screen with HORIZ POSITION. 5. Switch off ×10 MAG and adjust with **R2035 MAG CENT** so that the shift of 2nd pulse peak is minimized. ×10 MAG ON Setting  ×10 MAG OFF Adjustment  Input Signal : Time Marker 5 ms **POS CENT** 6. Set to DEFAULT. 7. Adjust with **R2231 POS CENT** so that the sweep start comes to the left edge of the scale. **1 ms/div at MAG ON** 8. Set TIME/DIV to 1 ms/div. 9. Adjust A sweep time over center 8 div on CRT **with R2205 x10 CAL.** **5 ns/div at MAG ON** 10. Set TIME/DIV to 5 ns/div. 11. Turn **R2284 and R2285** fully clockwise. 12. Adjust A sweep 5 ms/div over center 8 div on CRT with **C2220** and **C2226.**

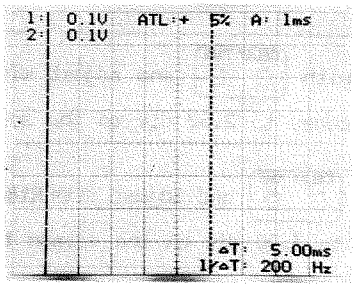
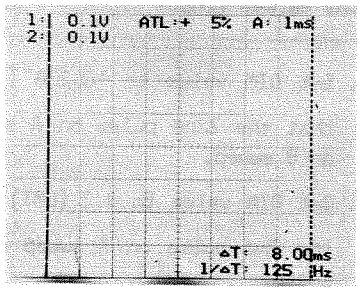
4-11-2 Sweep Time (Cont.)

Item	Description
	2 ns/div at MAG ON 13. Set TIME/DIV to 2 n/div. 14. Adjust A sweep time over center 8 div on CRT with **R2284** and **R2265.** **CAUTION** *Adjustment should be done repeatedly, since 2 ns/div and 5 ns/div affect each other.* **A·B Sweep Length** 15. Set TIME/DIV to 1 ms. 16. Adjust with **R1629 A SWEEP STOP** so that A sweep length is set to approximately 11 divisions. **B Sweep 0.5 ms** 17. Set as follows: HORIZ DISPLAY : B (DLY'D) A TIME/DIV : 1 ms/div B TIME/DIV : 0.5 ms/div Time marker (input signal) : 0.5 ms 18. Adjust B sweep time over center 8 div on with **R1867 B SWEEP CAL.** **A·B Start and Stop** 19. Set as follows: HORIZ DISPLAY : A INT & B (DLY'D) B TIME/DIV : 1 ms/div ×10 MAG : ON 20. Adjust with **R1831 B SWEEP START** so that the start of A sweep and that of B sweep meet each other. 21. Set B sweep to 0.1 ms/div and adjust with **R1821 B SWEEP STOP** so that the end of A sweep and that of B sweep more or less meet each other. **B Sweep 5 μs/div** 22. Set as follows: A TIME/DIV : 10 *s/div B TIME/DIV : 5 *s/div 23. Adjust B sweep time over 8 div on CRT with **C1899.**
Adjuster locations	R2210, R2231, R2205, R2284, R2285, C2220, C2220 and C2226 (Figure 4-7-9) R1629 (Figure 4-7-12) R2035, R1867, R1831, R1821 and C1899 (Figure 4-7-11)

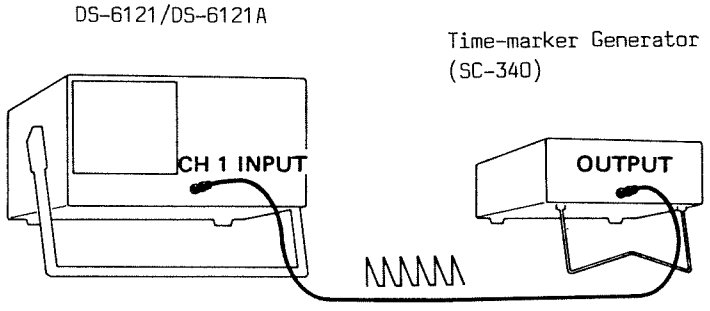
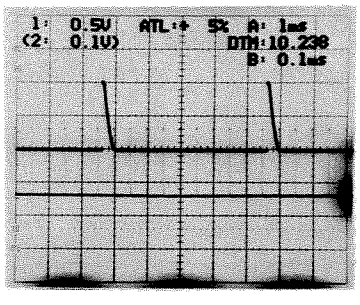
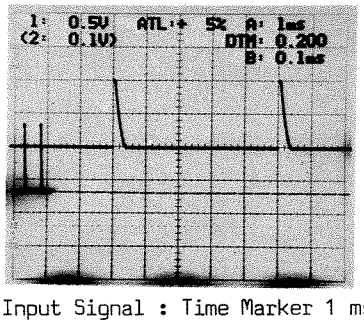
4-11-2 Sweep Time (Cont.)

Item	Description
Reference	Sweep Time Error Ratio = $\frac{a - b}{a} \times 100\ (\%)$ a : Effective Horizontal Surface b : Measured Value of Time-marker Corresponding to a b  a Computing Method of the Waveform Error a : 8 div b : 7.9 div Error = $\frac{(8 - 7.9)}{8}$ div $\times 100\ (\%) = 1.25\%$

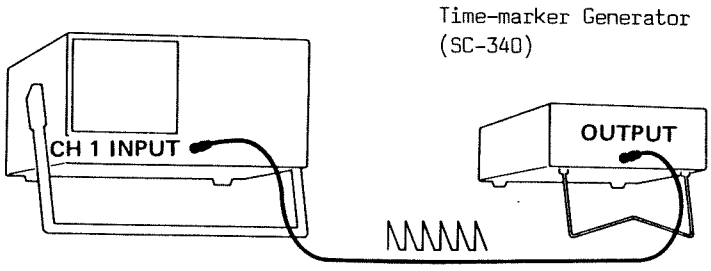
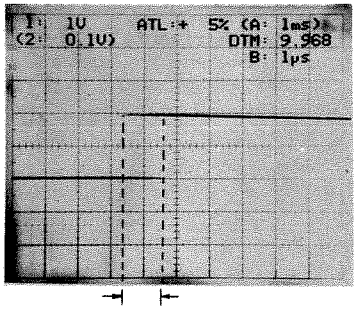
4-11-3 Initial Position of Time Cursor

Item	Description
Rating	Cursor 1 1 div ± 0.3 div leftward from the center of the CRT screen Cursor 2 1 div ± 0.3 div rightward from the center of the CRT screen
Check and adjustment	**Cursor Position** 1. Set to DEFAULT. 2. Press keys as follows procedures to display time cursors. GUIDE MENU → 1 → 3 3. Set cursor 1 read value to ±5.00 ms. 4. Set cursor 2 read value to ±8.00 ms. 5. Adjust with **R2271 CHARA POS.** and **R2262 CHARA GAIN** so that cursor 1 comes to the center of the CRT screen -4 div and cursor 2 to +4 div. **Stable of Characters** 6. Set ×10 MAG to ON. 7. Adjust with **C2209** and **R2225** to minimize unstability of a character by changing A TIME/DIV.
CRT waveform	 
Adjuster locations	R2271, R2262, C2209 and R2225 (Figure 4-7-9)

4-11-4 DELAY START and STOP

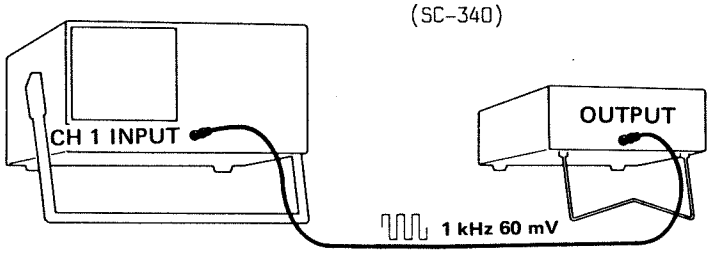
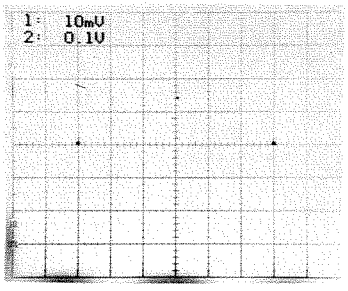
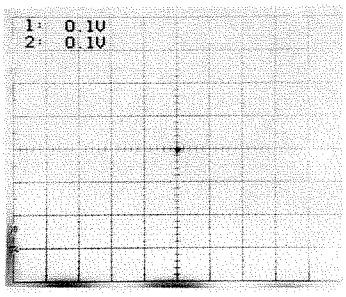
Item	Description
Rating	3% (1 µs/div to 0.1 µs/div)
Connection	
Setting	HORIZ DISPLAY : A INT & B (DLY'D) A TIME/DIV : 1 ms B TIME/DIV : 0.1 ms Time marker (input signal) : 0.5 ms
Check and adjustment	1. Set DIM value to 10.238 (LMT) with DELAY TIME ⇦ ⇨ and adjust with **R1850 DELAY STOP** so that the 22nd pulse on A sweep comes to 2.62 div on the screen from the left end on B sweep. 2. Set DIM value to 0.2 (LMT) with DELAY TIME ⇦ ⇨ and adjust with **R1848 DELAY START** so that the 2nd pulse on A sweep comes to 3.00 div on the screen from the left end on B sweep. **CAUTION** *Adjustment should be done repeatedly, since DELAY START and DELAY STOP affect each other.*
CRT waveform	DELAY TIME MULT Start Location  Input Signal : Time Marker 0.2 ms DELAY TIME MULT Stop Location  Input Signal : Time Marker 1 ms
Adjuster locations	R1850 and R1848 (Figure 4-7-12)

4-11-5 Delay Jitter

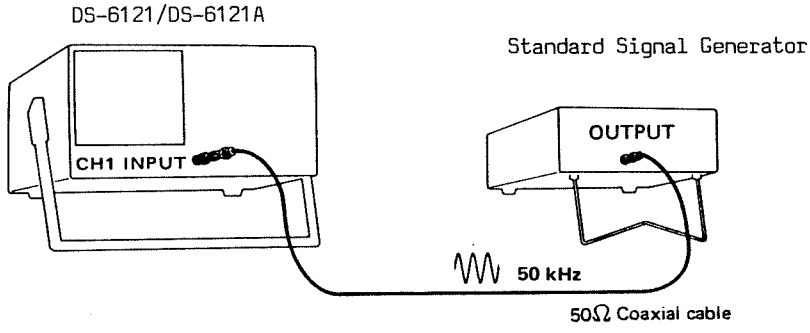
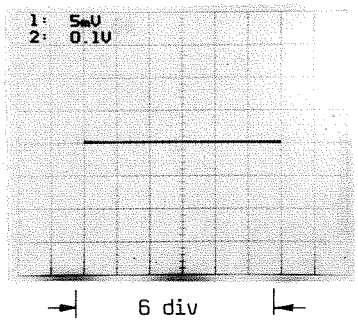
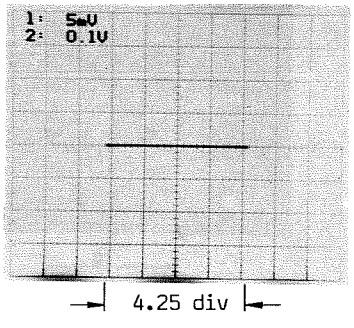
Item	Description
Rating	1/10000 or less
Connection	DS-6121/DS-6121A 
Setting	HORIZ DISPLAY : B B SOURCE : RUN AFT DELAY A TIME/DIV : 1 ms B TIME/DIV : 1 µs
Check and adjustment	1. Set the CRT amplitude to 2 divisions. 2. Set DIM value to around 10 and check that the jitter width is less than 1 division.
CRT waveform	 Within 1 div Input Signal : Time Marker 1 ms

4-12 X–Y OPERATION

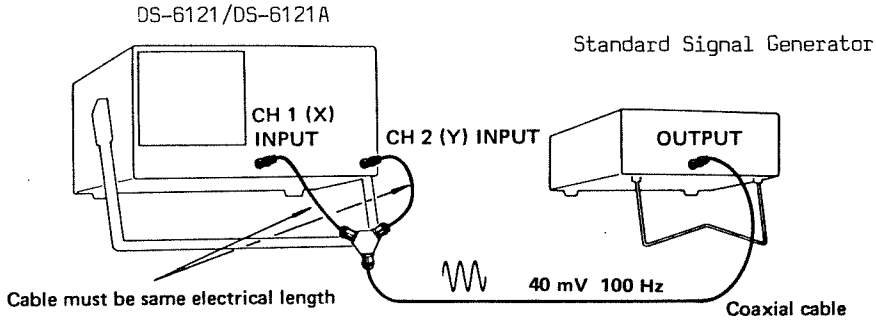
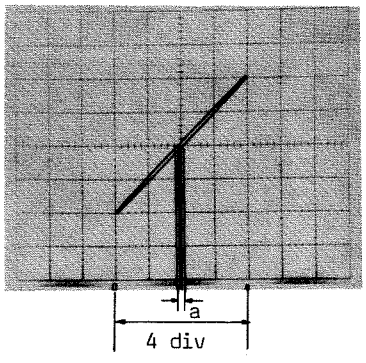
4-12-1 GAIN and POSITION

Item	Description
Rating	Gain (Same as Vertical Deflection System) Accuracy 3%
Connection	DS-6121/DS-6121A Square Wave Generator (SC-340) 
Setting	HORIZ DISPLAY : X-Y CH1 VOLTS/DIV : 10 mV/div CH1 V COUPL : DC Square wave generator (input signal) : 60 mV
Check and adjustment	1. Adjust with **R0539 X–Y GAIN** so that the horizontal (X) amplitude is set to 6 divisions. 2. Press the keys as follows. DEFAULT HORIZ DISPLAY : X-Y V COUPL : GND 3. Adjust with **R0542 X–Y POS** so that the trace comes to the center of the CRT screen.
CRT waveform	Gain Adjustment  Positional Adjustment 
Adjuster locations	R0539 and R0542 (Figure 4-7-12)

4-12-2 Bandwidth

Item	Description
Rating	DC to 2 MHz -3 dB
Connection	
Setting	Same as 4-12-1
Check and adjustment	1. Set the reference frequency to 50 kHz and adjust the signal generator so that the amplitude swings 6 divisions. 2. Then, change the frequency to 2 MHz and read the amplitude to check whether it is within the rating.
CRT waveform	Reference Frequency (50 kHz)  6 div Rating Frequency  4.25 div or more

4-12-3 Phase Difference

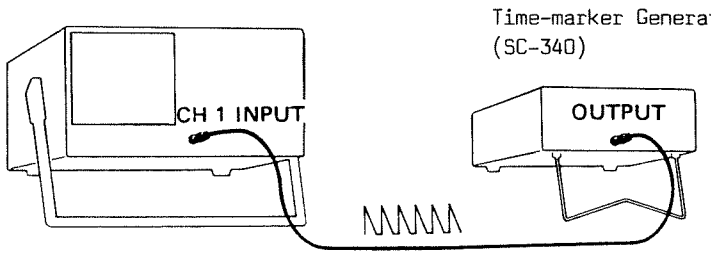
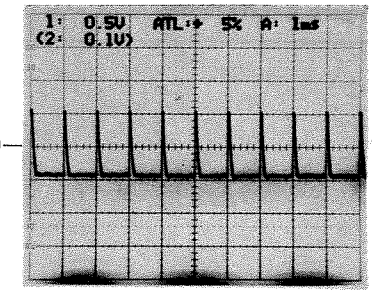
Item	Description
Rating	Within 3° (DC to 100 kHz sine wave)
Connection	
Setting	HORIZ DISPLAY : X-Y CH1•CH2 V COUPL : DC CH1•CH2 VOLTS/DIV : 10 mV
Check and adjustment	Read "a" on the screen and check the reading is less than 0.3 division.
CRT waveform	 Input Signal : Sine Wave 100 kHz 40 mV

4-13 A/D CONVERTER

4-13-1 A/D IC Reference Voltage

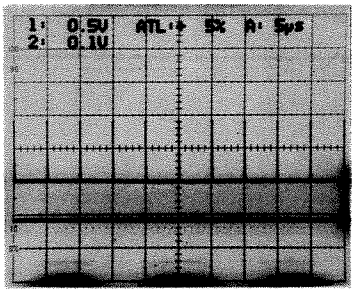
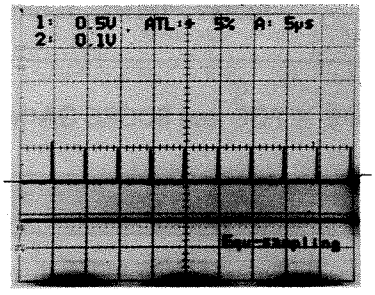
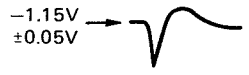
Item	Description
Rating	-2.00 V ± 0.02 V
Check and adjustment	1. Adjust with **R40142 V REF** so that the voltage between IC40101 pin 28 and GND is to -2.00 V. 2. Adjust with **R40342 V REF** so that the voltage between IC40301 pin 28 and GND is set to -2.00 V.
Adjuster locations	R40142, R40342, IC40101 and IC40301 (Figure 4-7-13)

4-13-2 SCOPE X POS and SCOPE GAIN

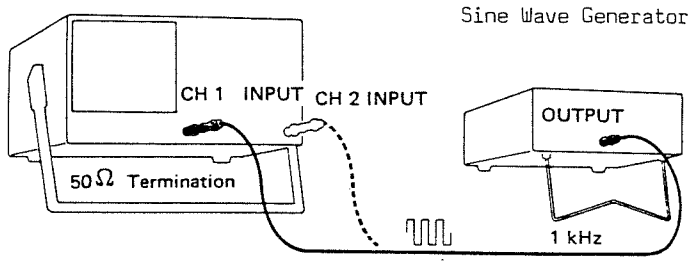
Item	Description
Connection	DS-6121/DS-6121A 
Check and adjustment	1. Set to DEFAULT. 2. Input 1 ms the marker and set STORAGE to ON. 3. Adjust with **R2022 SCOPE X POS** so that the time-marker start location meets the left end of the screen. 4. Adjust with **R2017 SCOPE X GAIN** so that the time-marker waveform meet the CRT screen scale.
CRT waveform	Start Location— 
Adjuster locations	R2022 and R2017 (Figure 4-7-11)

4-13-3 Equ-SAMPLE

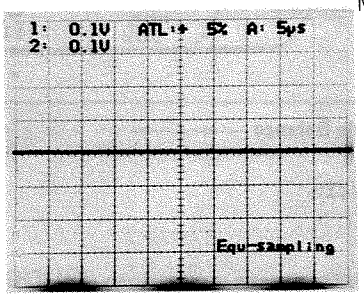
4-13-3-1 Equ-Sampling I

Item	Description
Connection	Same as 4-13-2
Check and adjustment	**START and STOP** 1. Set A TIME/DIV to 5 µs. 2. Input 5 µs time marker and adjust with **R40506 EQU START** and **R40504 EQU STOP** so that Real Mode waveform more or less meet that of Equ-sampling. 1) Real mode  2) Equ-sampling  Adjust with R40506 Adjust with R40504 **Comparator** 3. Observe IC40503 (Am685) pin 6 terminal under Equ-sampling mode with test oscilloscope and adjust with **R40517** as shownin figure below.  −1.15V ±0.05V **High Rate Linearity** 4. Set A TIME/DIV to 20 ns and set to Equ-sampling mode. 5. Input 20 ns time marker and adjust with **C2301**, **C2305** and **R2346** so that X linearity is set to the best. 6. Check the linearity at A TIME/DIV 50 ns.
Adjuster locations	R40506, R40504, IC40503, R40517 (Figure 4-7-13) C2301, C2305, R2346 (Figure 4-7-14)

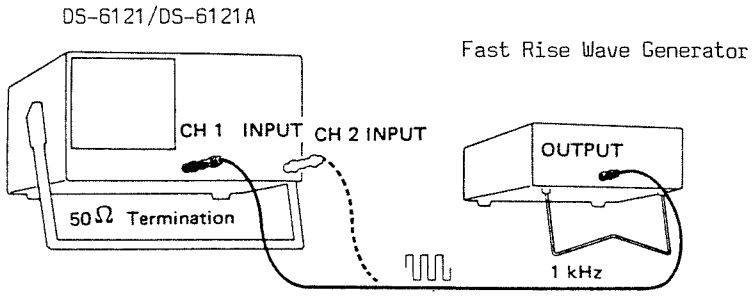
4-13-3-2 Equ-Sampling II

Item	Description
Connection	DS-6121/DS-6121A 
Check and adjustment	**Sample Gain and Sample Balance** 7. Set as follows. CH1•CH2 VOLTS/DIV : 10 mV/div CH1•CH2 V COUPL : DC A TIME/DIV : 5 µs 8. Input approximately 100 kHz square wave into CH1•CH2 under real mode and adjust the amplitude to 6 divisions. 9. Adjust with **R40304 GAIN BAL** under Equ-sampling mode so that the difference in GAIN between CH1 and CH2 is extinguished. 10. Adjust with **R10150** so that the waveform is flat. 11. Adjust with **R10120 SMPL GAIN** so that the amplitude is set to 6 divisions. **Sample Position** 12. Set as follows. STORAGE : OFF CH1•CH2 V COUPL : GND 13. Set CH1•CH2 trace to the center of the screen. 14. Reset to Equ-sampling mode, check J1001 pin 2 or P40601 pin 1 with a digital tester, and adjust with **R10148 SMPL POS** more or less to 0 V.
Adjuster locations	R40304 (Figure 4-7-13) R10150, R10120, R10148 (Figure 4-7-14)

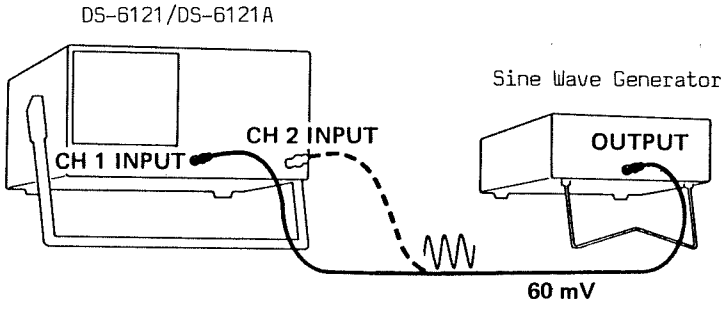
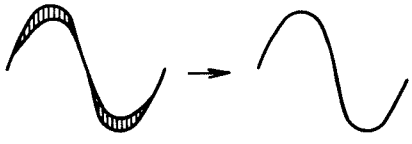
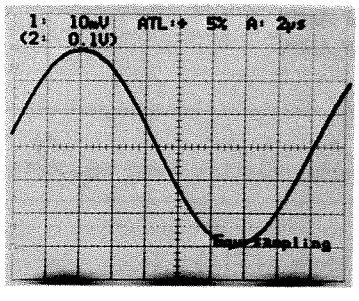
4-13-3-3 Equ-Sampling III

Item	Description
Check and adjustment	**Offset Adjustment** 15. Set as follows. STORAGE : OFF CH1•CH2 V COUPL : GND 16. Set CH1•CH2 trace to the center of the screen. 17. Adjust with **R40135 OFS (CH1)** and **R403350 OFS (CH2)** under Equ-SAMPLE mode so that CH1•CH2 traces come to the center of the screen.
CRT waveform	No Input Signal 
Adjuster locations	R40135, R40335 (Figure 4-7-13)

4-13-3-4 Equ-Sampling IV

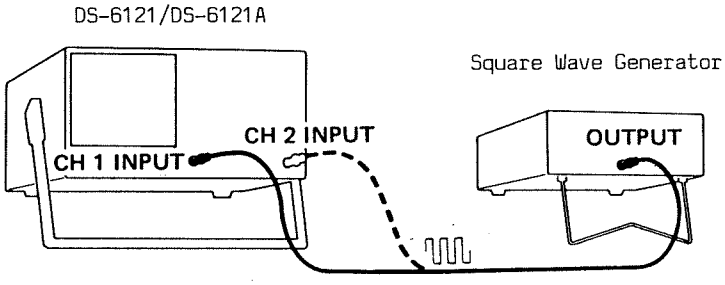
Item	Description
Connection	
Check and adjustment	**Square Wave Characteristics** 18. Set as follows V. MODE : CH1 VOLTS/DIV : 10 mV A TIME/DIV : 20 ns 19. Input the fast rise square wave generator. 20. Adjust the square wave with **C1035, C1036** and **R10121** so that the overshoot is set to less than 8%. 21. Adjust the frequency characteristic difference between CH1 and CH2 with **C40144.** **CAUTION** *When the waveform adjustment is difficult with the above-mentioned adjusters, readjust with real waveform, using the following adjusters.* *C0311, R0346 (CH1 PRE AMP)* *C0411, R0466 (CH2 PRE AMP)* *R1029 (MAIN AMP)* 22. Check the frequency characteristics under Equ-SAMPLE mode.
Adjuster locations	C40144 (Figure 4-7-13) C1035, C1036 and R10121 (Figure 4-7-14) C0311, C0411, R0346 and R0446 (Figure 4-7-6) R1029 (Figure 4-7-7)

4-13-3-5 Equ-Sampling V

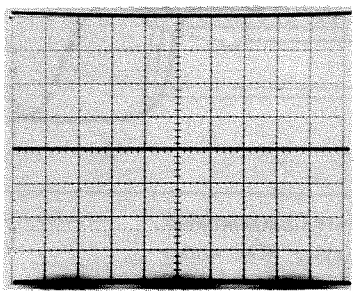
Item	Description
Connection	
Check and adjustment	———— **Bi-ϕ GAIN Balance** ———— 18. Set as follows. CH1 VOLTS/DIV : 10 mV TIME/DIV : 2 µs 19. Input 50 kHz sine wave and set the CRT amplitude to 5 divisions. 20. Adjust the waveform (a) to (b) with **R40603** under Equ-SAMPLE mode.  (a) (b)
CRT waveform	 Input Signal : Sine Wave 50 kHz
Adjuster locations	R40603 (Figure 4-7-13)

4-13-4 STORAGE MODE

4-13-4-1 Storage Mode I

Item	Description
Connection	
Check and adjustment	**Square Wave Characteristics** 1. Set as follows under REAL mode: CH1•CH2 VOLTS/DIV : 10 mV/div CH1•CH2 V COUPL : 0.1 ms/div 2. Input 10 kHz to 100 kHz square wave and set the amplitude to 6 divisions. 3. Adjust the square overshoot with **R0758 (CH1)** and **R0858 (CH2)** under STORAGE mode. **A/D GAIN** 4. Adjust GAIN with **R0742 CH1 A/D GAIN** and **R0842 CH2 A/D GAIN** so that it becomes equal to REAL mode. **A/D POS** 5. Set CH1•CH2 V COUPL to GND under REAL mode. 6. Set the trace to the center of the screen and adjust with **R0756 CH1 A/D POS** and **R0856 CH2 A/D POS** so that the trace comes to the center of the screen under STORAGE mode.
Adjuster locations	R0758, R0742 and R0756 (Figure 4-7-10) R0858, R0842 and R0856 (Figure 4-7-8)

4-13-4-2 Storage Mode II

Item	Description
Check and adjustment (Cont.)	——— **POS GAIN** ——— 7. Set CH1•CH2 trace to the following position under REAL mode and adjust with **R0509 CH1 POS GAIN** and **R0609 CH2 POS GAIN** so that the trace difference is less than 0.3 divisions under STORAGE mode. Trace vertical position +4 div, center and -4 div
CRT waveform	 +4 div Center -4 div **CAUTION** *When POS GAIN is adjusted, readjust also the vertical trace start location, POLARITY BALANCE and NORM TRIG DC level.*
Adjuster locations	R0509 (Figure 4-7-10) R0609 (Figure 4-7-5)

4-13-5 A/D Waveform Skip

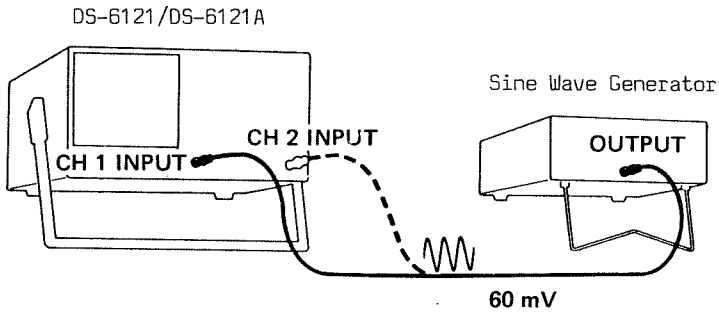
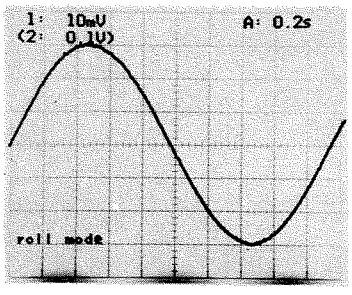
Item	Description
Connection	
Check and adjustment	1. Set to 0.2 s/div (ROLL mode) under REAL mode. 2. Input approximately 1 period of sine wave on the screen. 3. Adjust with **R40140 (CH1)** and **R40340 (CH2)** so that the waveform skip is minimized.
CRT waveform	 Input Signal: Sine Wave 0.5 Hz
Adjuster locations	R40140 and R40340 (Figure 4-7-13)

Figure 4-7-1. Power Supply 66

Rear

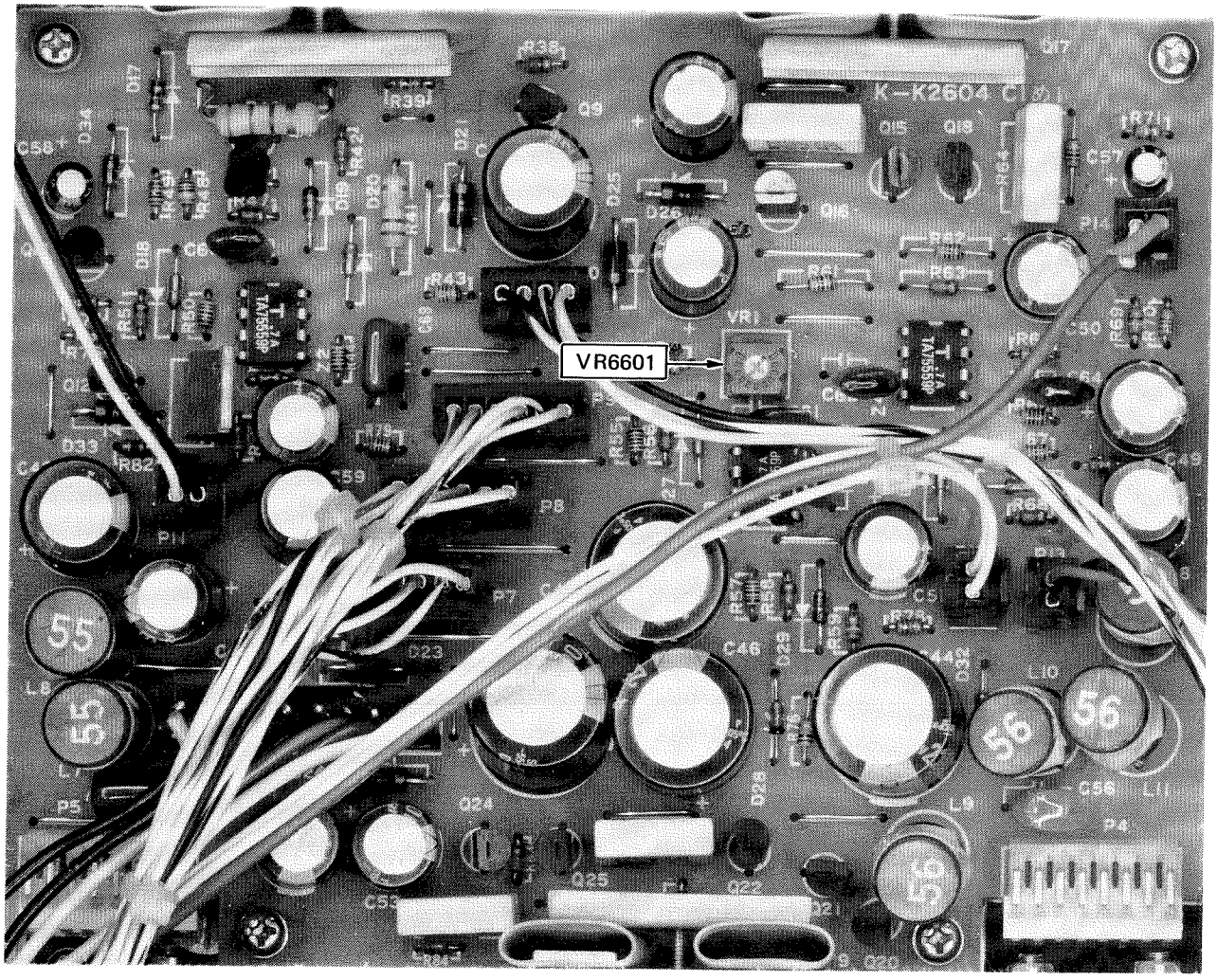
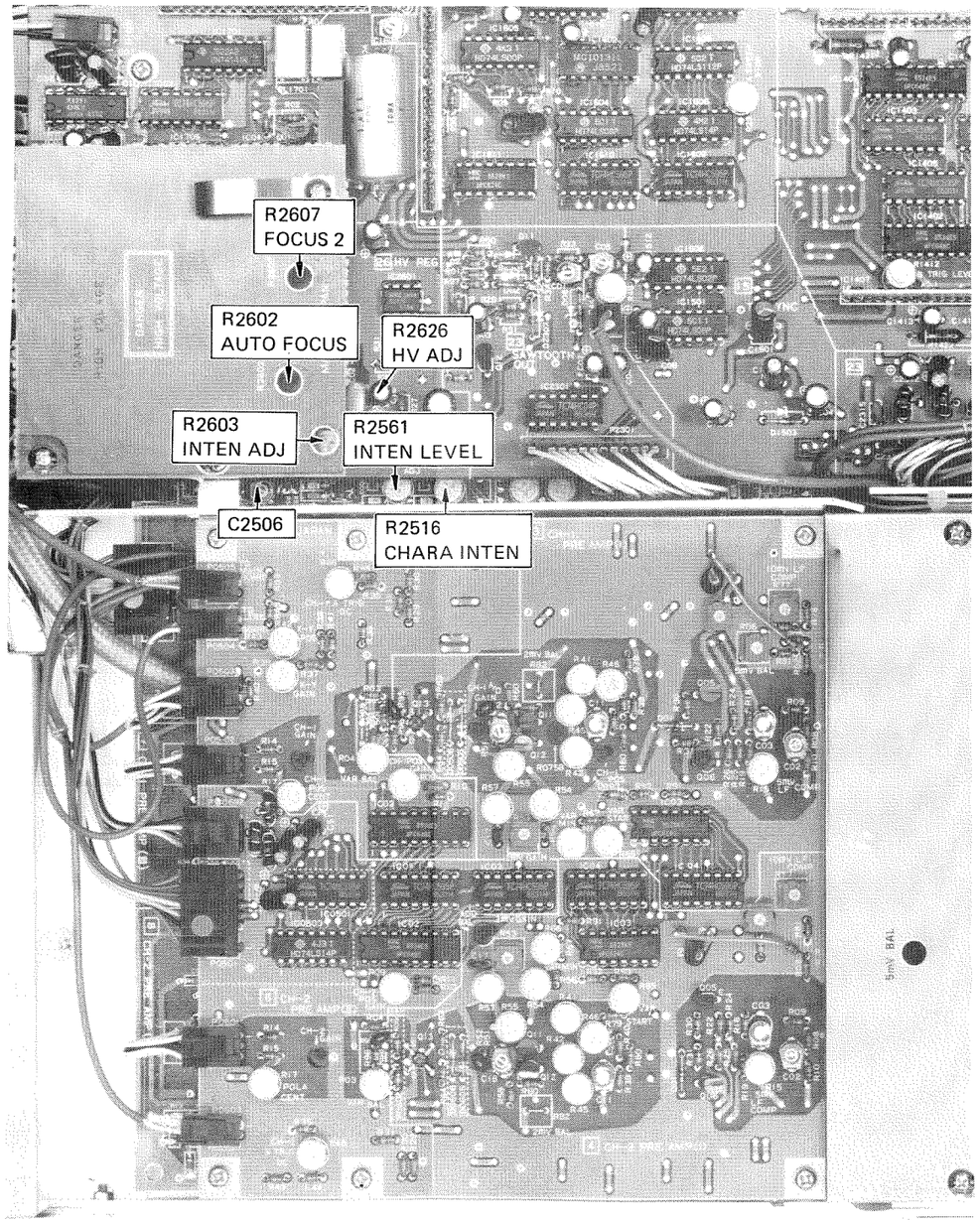


Figure 4-7-2. Z AMP [25] and HV REG [26]

BOTTOM



Rear **Front**

Figure 4-7-3. EXT SIG OUT 24

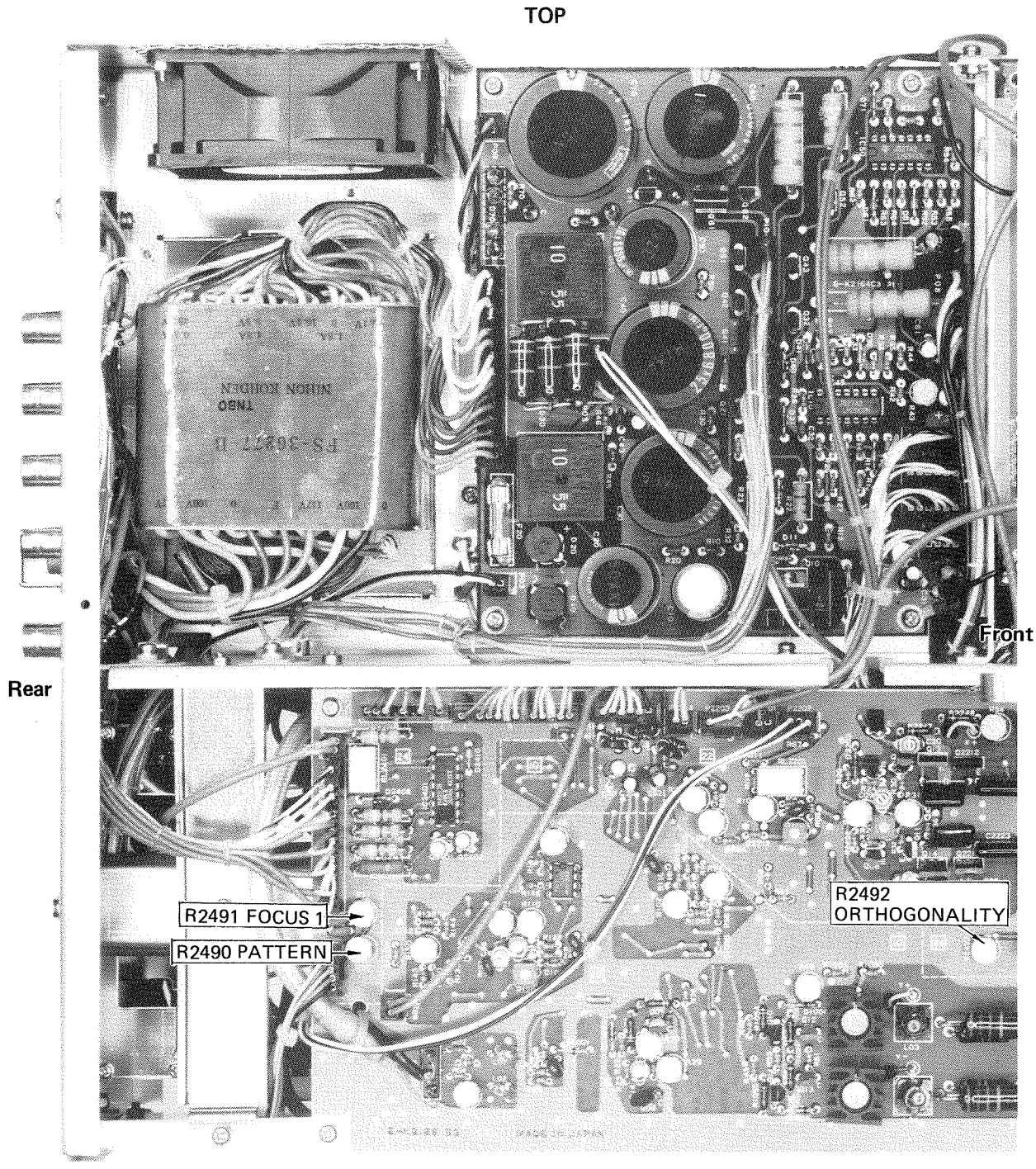


Figure 4-7-4. VR CIRCUIT 28

BOTTOM

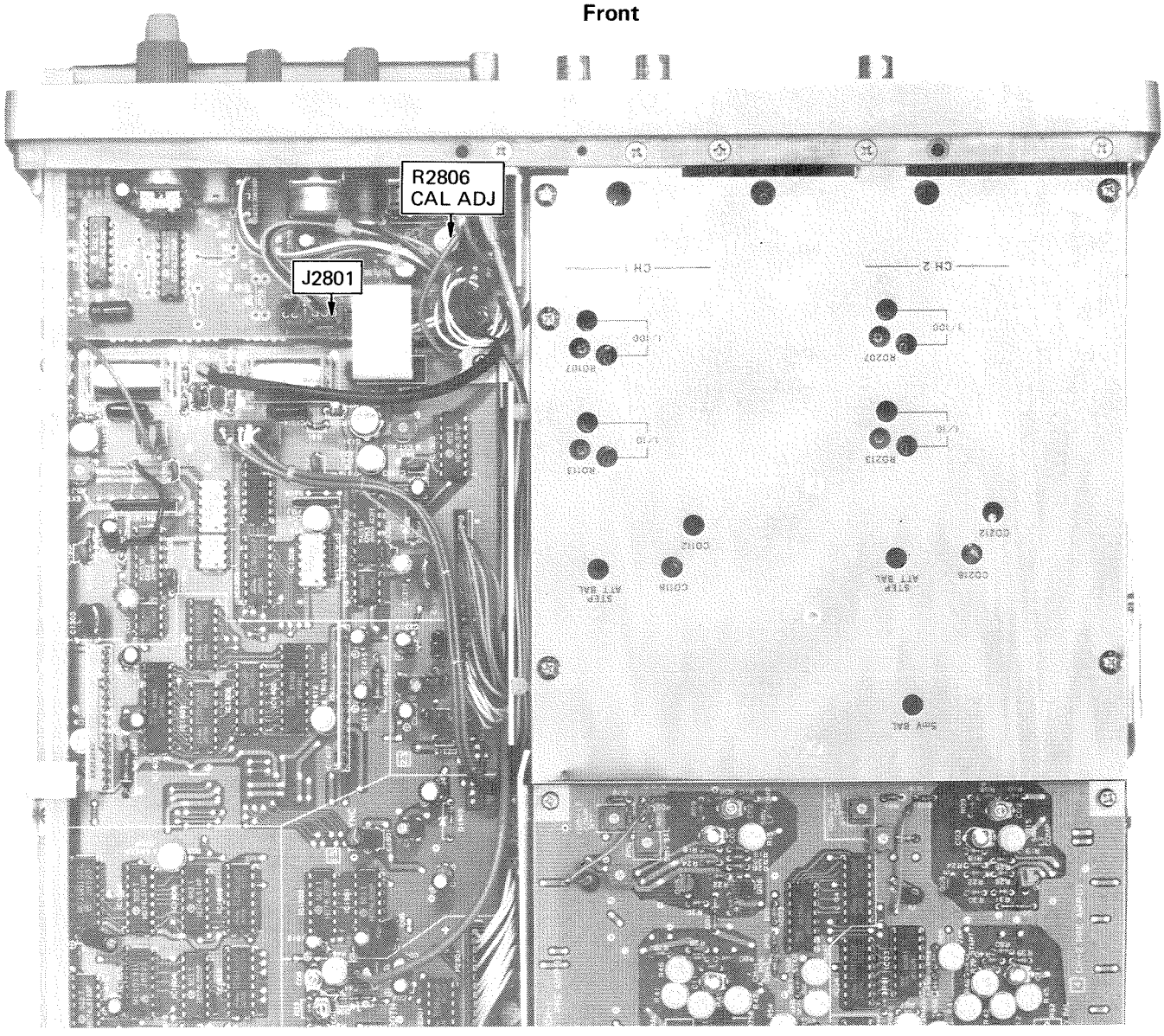


Figure 4-7-5. CH1·2 ATT [1][2], CH1·2 PRE AMP I II III [3][4][5][6][7][8] and VERT SWITCH [9]

BOTTOM

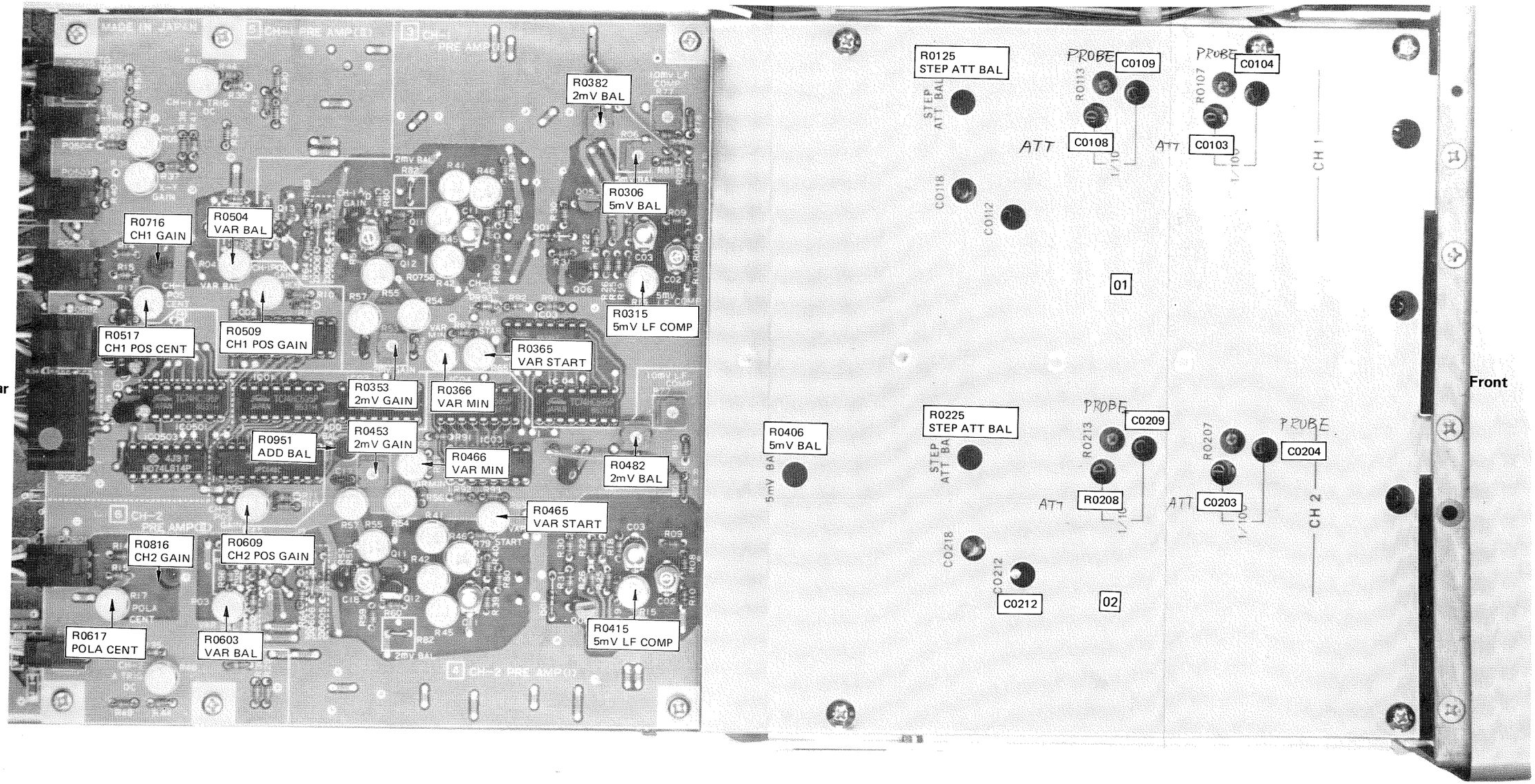


Figure 4-7-6. CH1•2 ATT [1][2] and CH1•2 PRE AMP (I) [3][4]

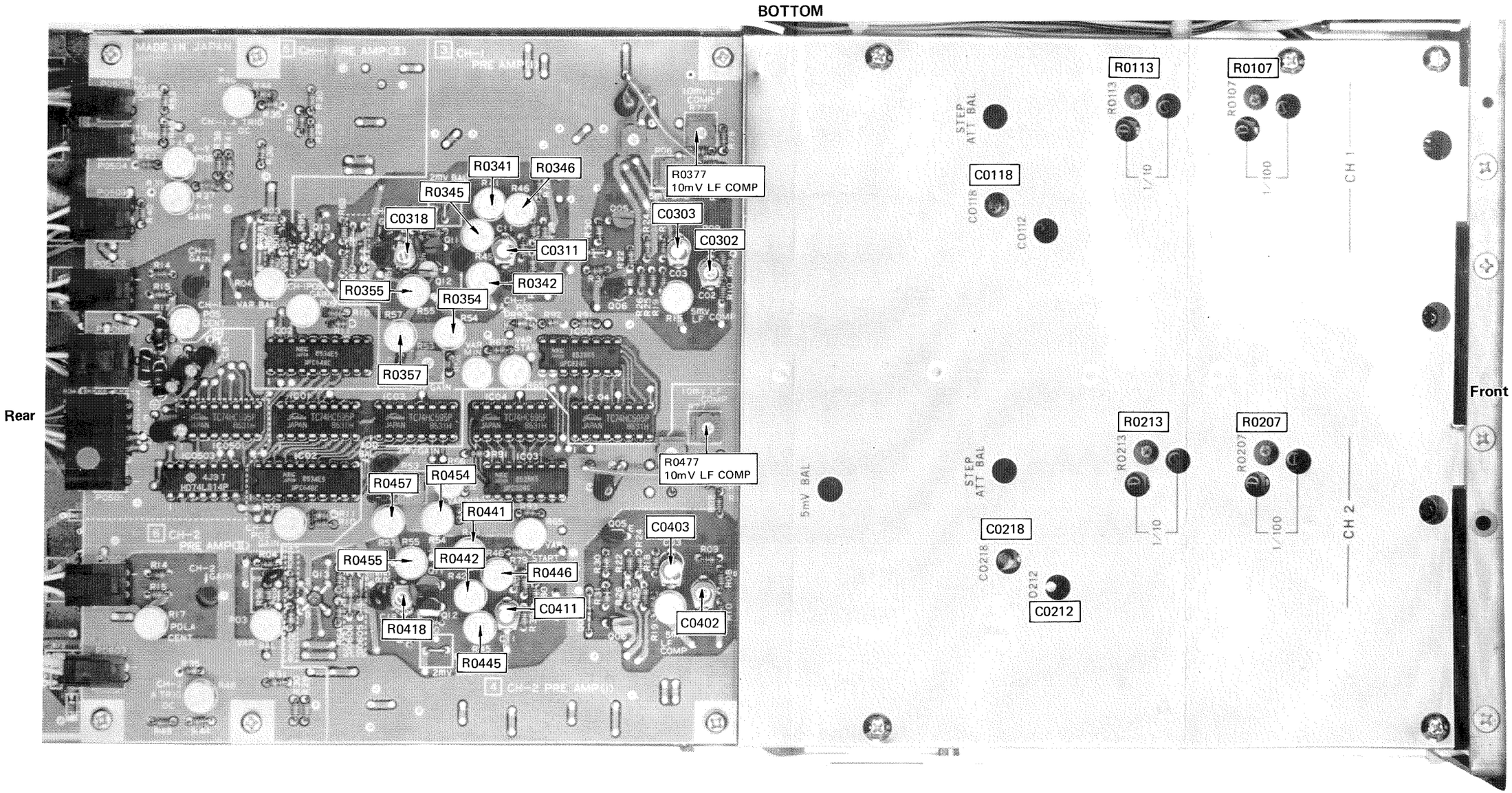


Figure 4-7-7. V OUTPUT AMP 10

TOP

Rear

Front

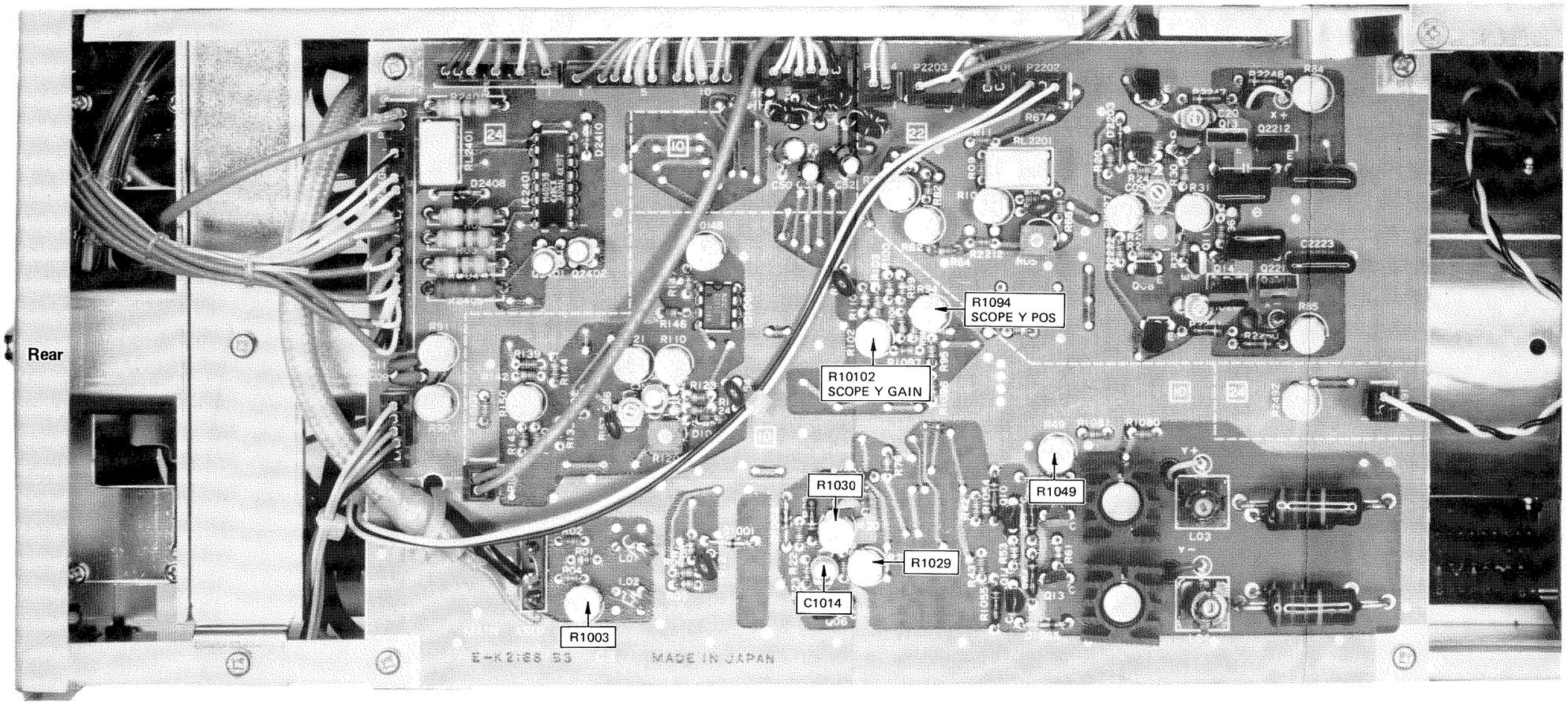


Figure 4-7-8. CH2 PRE AMP [8], VERT SWITCH [9] and CHARACTER CIRCUIT [58]

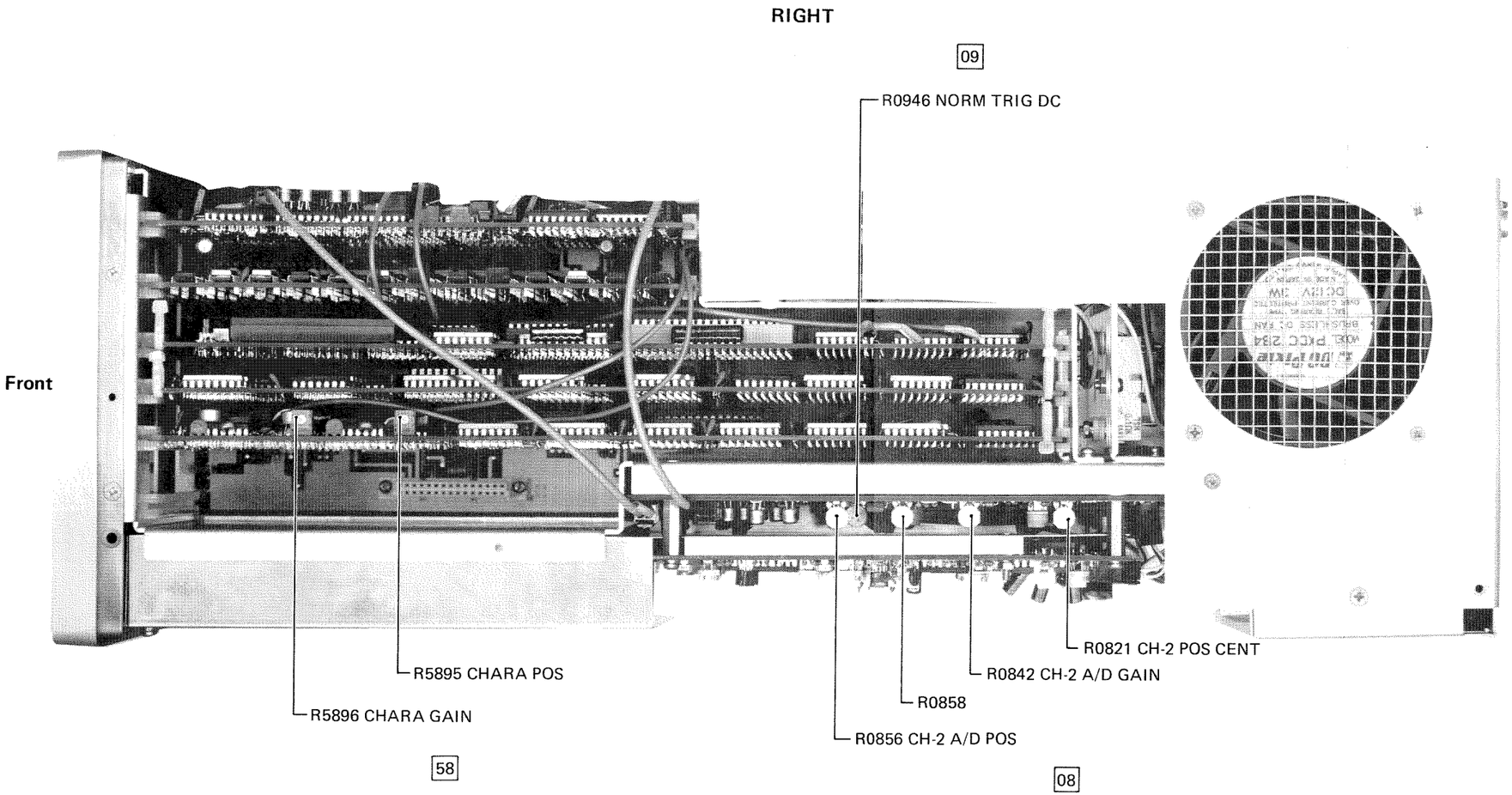
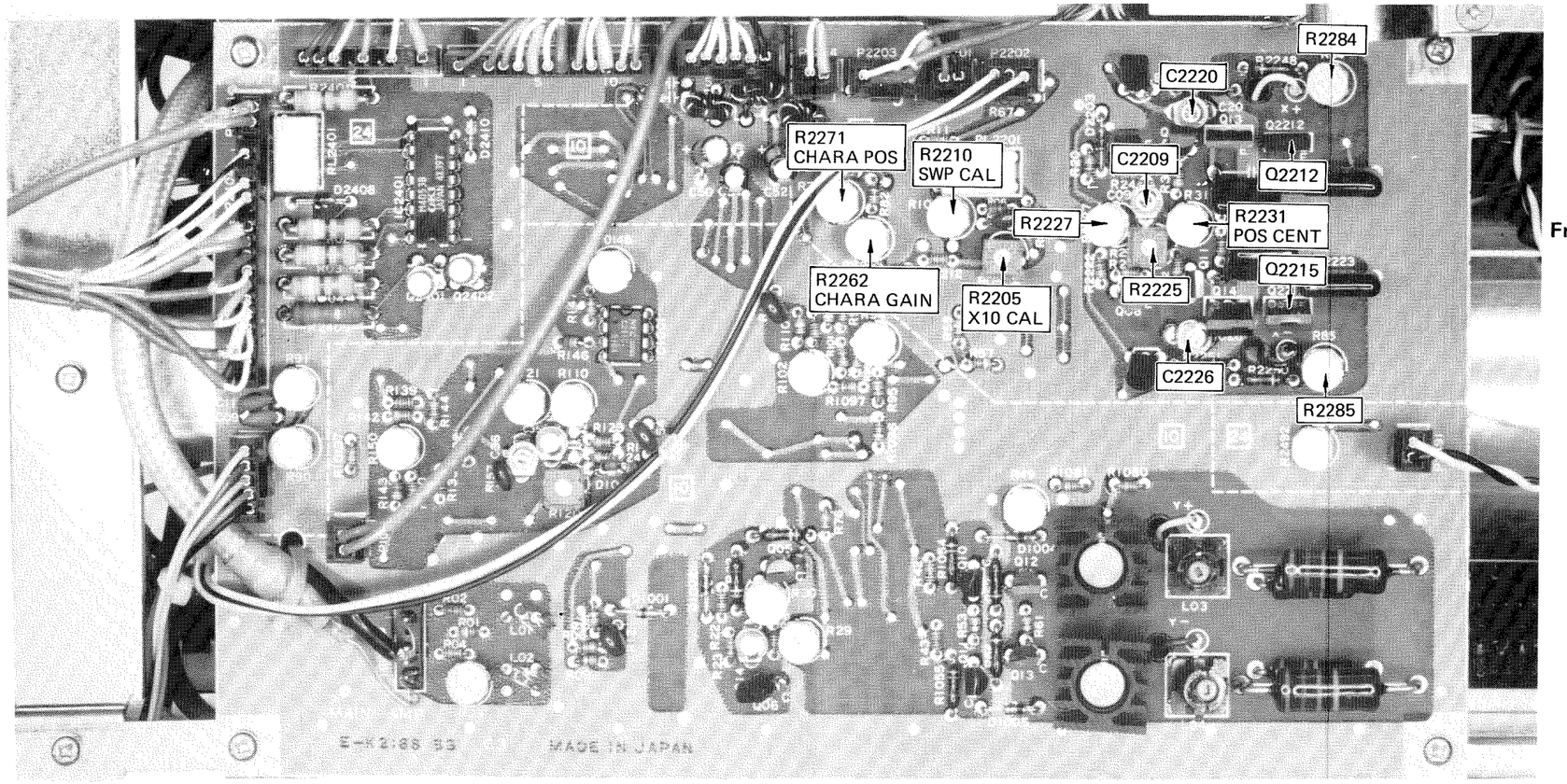


Figure 4-7-9. HORIZ AMP 22

TOP

Rear



Front

Figure 4-7-10. CH1•2 PRE AMP [5][6], CH1 PRE AMP III [7] TRIG COUPLING [13], A & B TRIG AMP [14] and SAWTOOTH OUT [23]

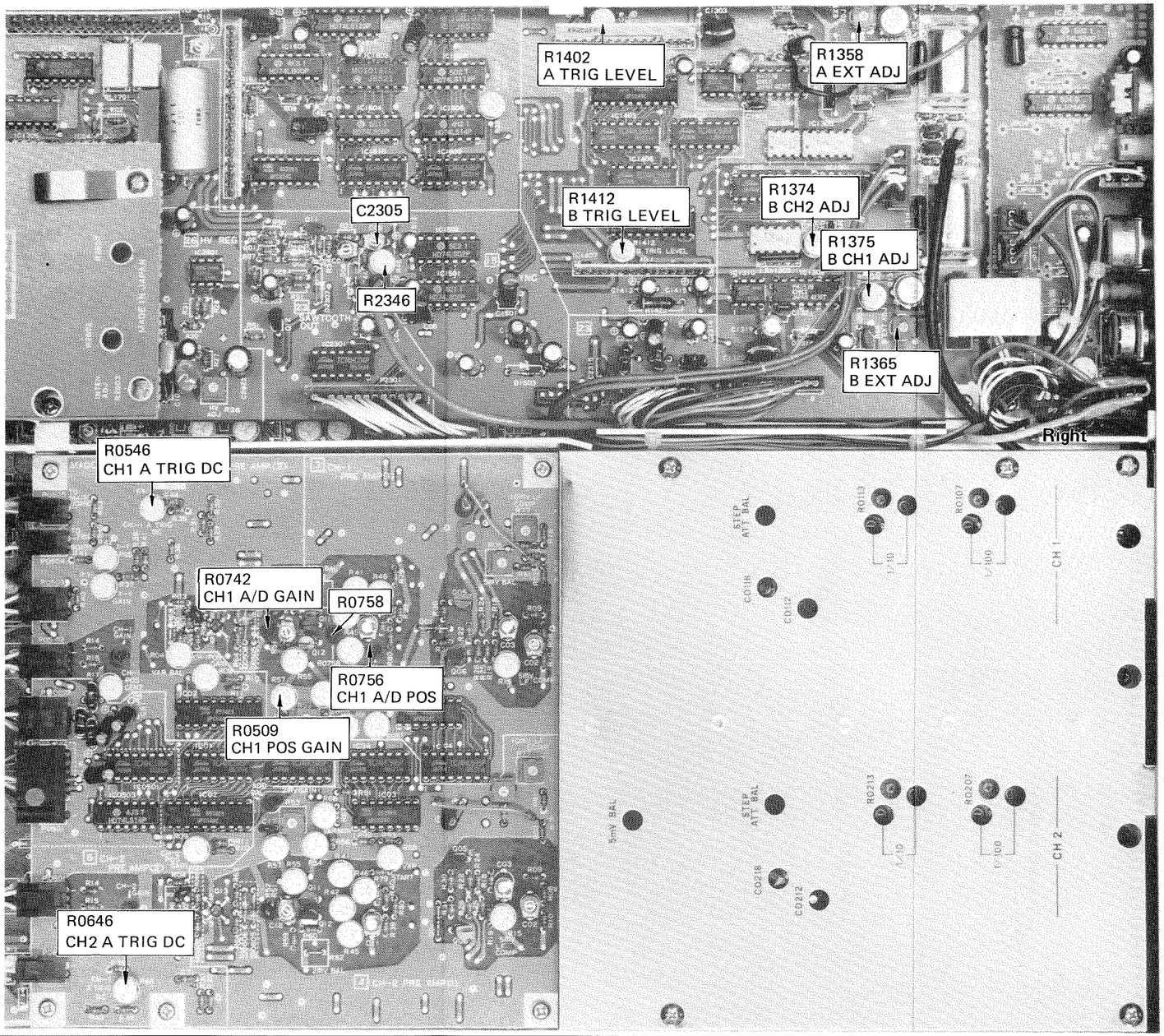


Figure 4-7-11. B SWEEP GENERATOR [18] and HORIZ DISP [20]

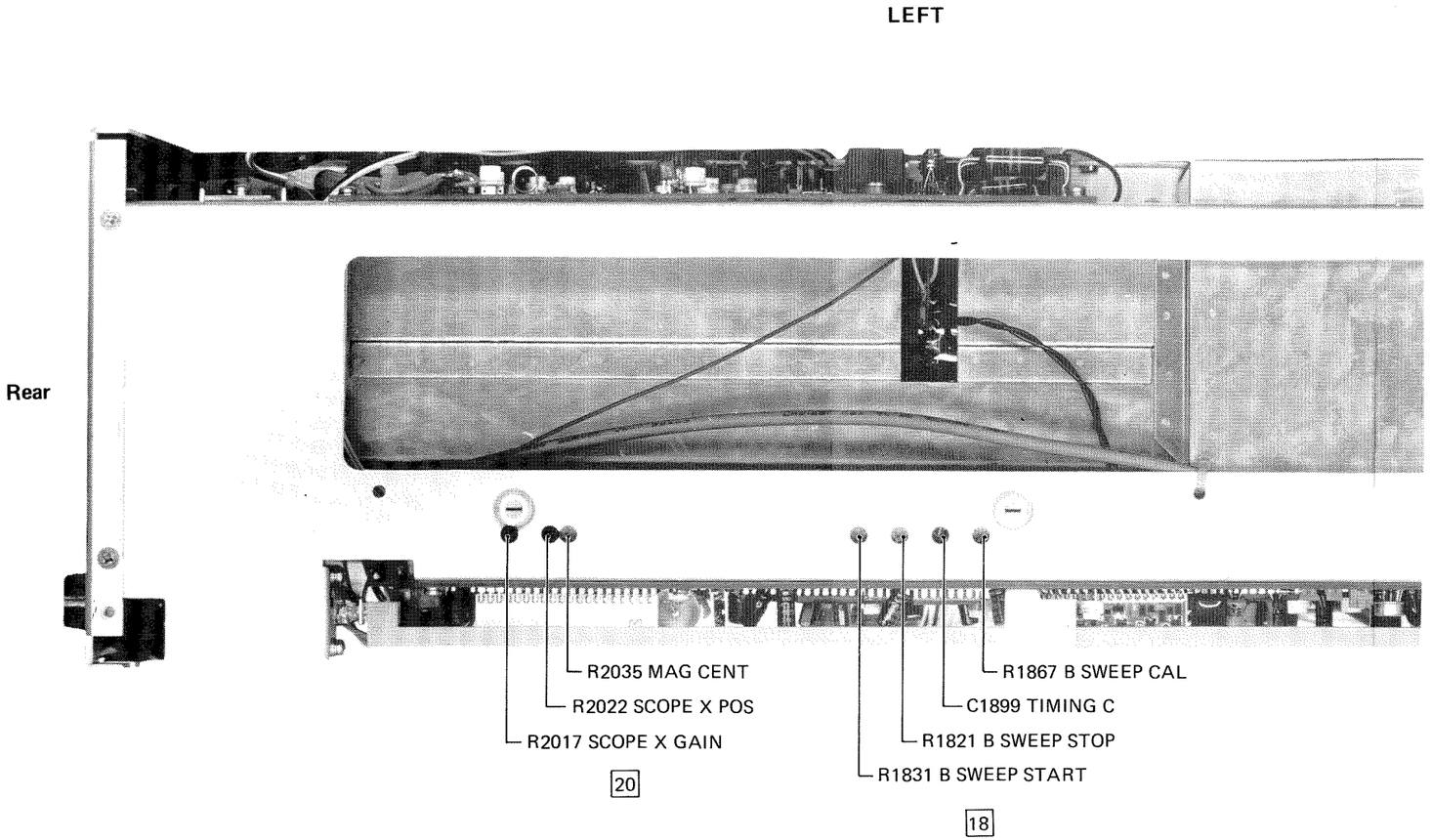


Figure 4-7-12. CH1 PRE AMP II [5], A SWEEP GENERATOR [16] and B SWEEP GENERATOR [18]

BOTTOM

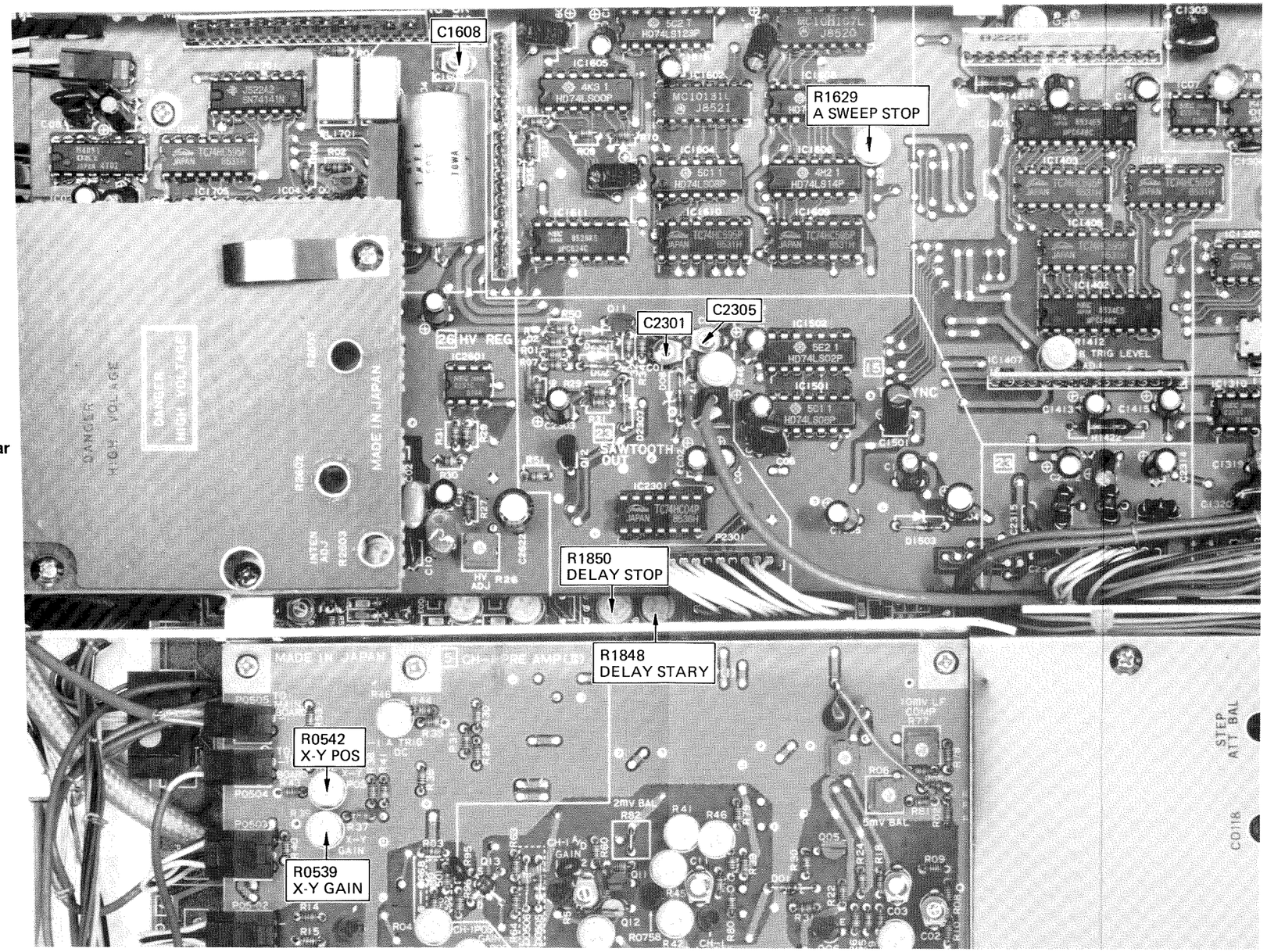


Figure 4-7-13. A/D CONVERTER 40

TOP

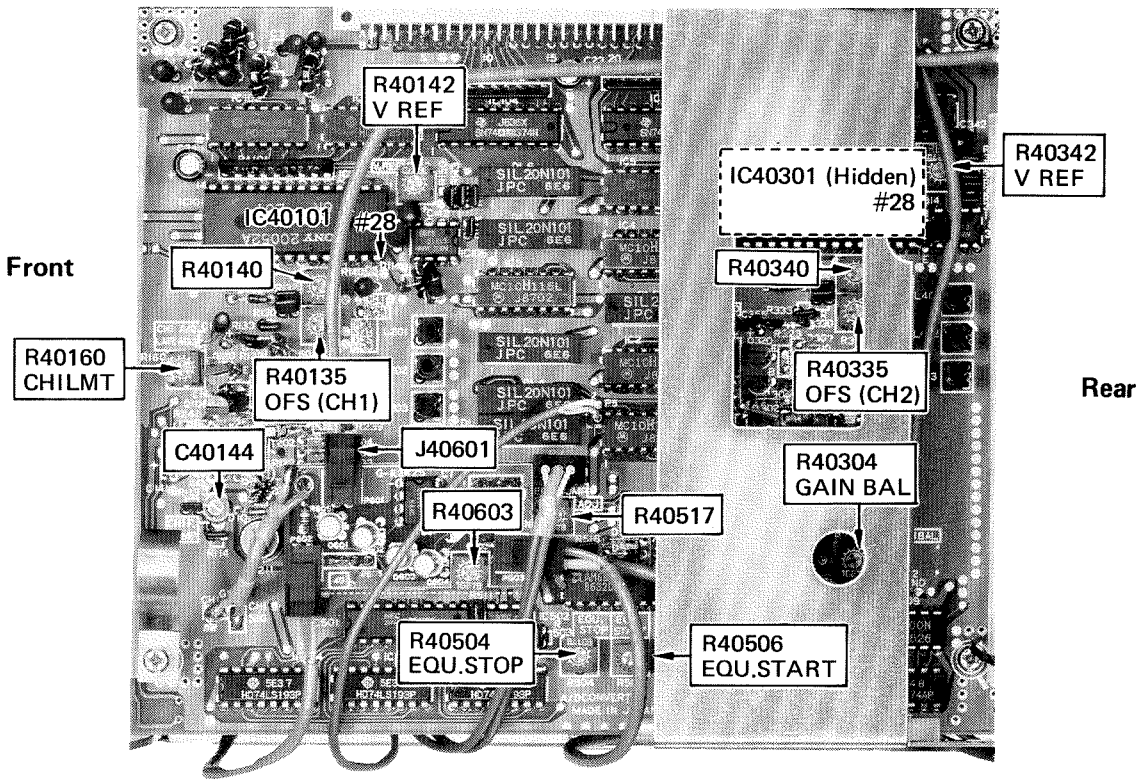
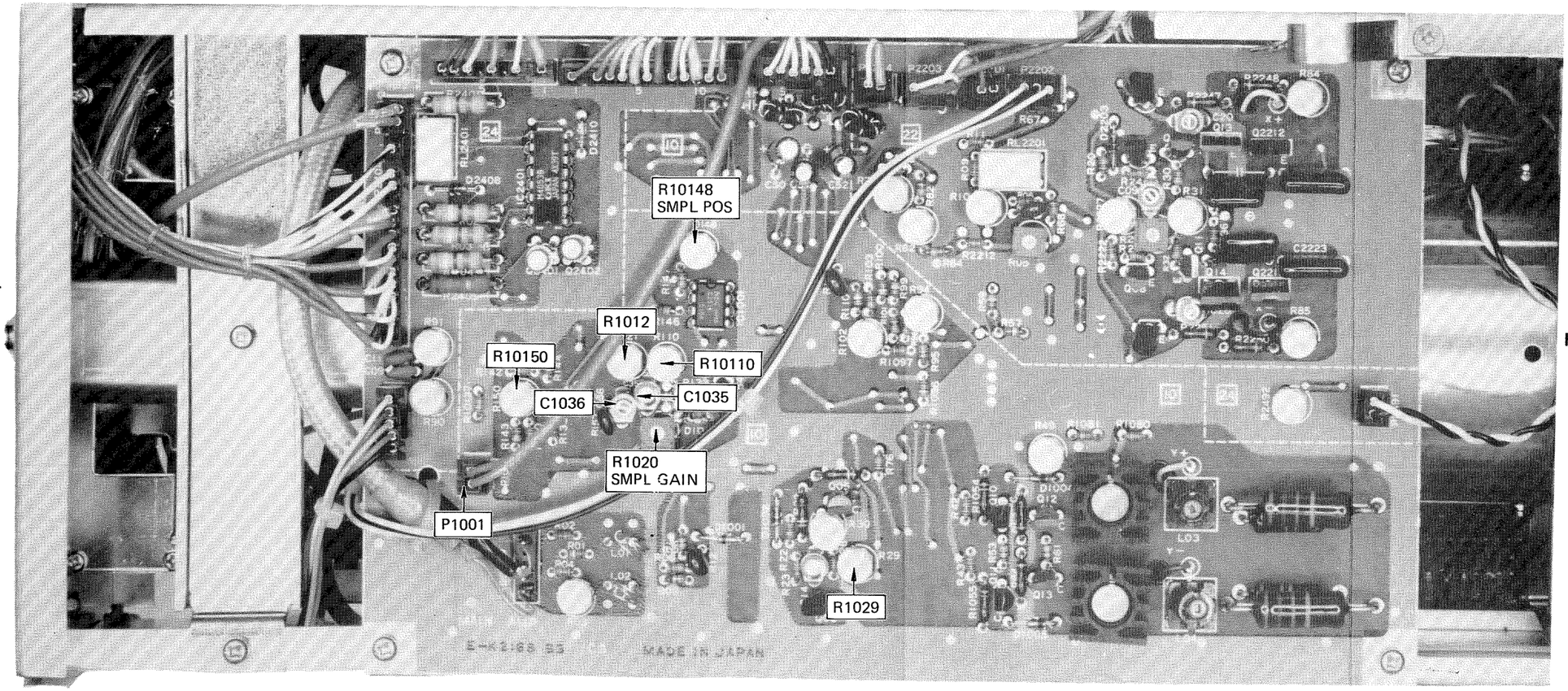


Figure 4-7-14. V OUTPUT AMP 10

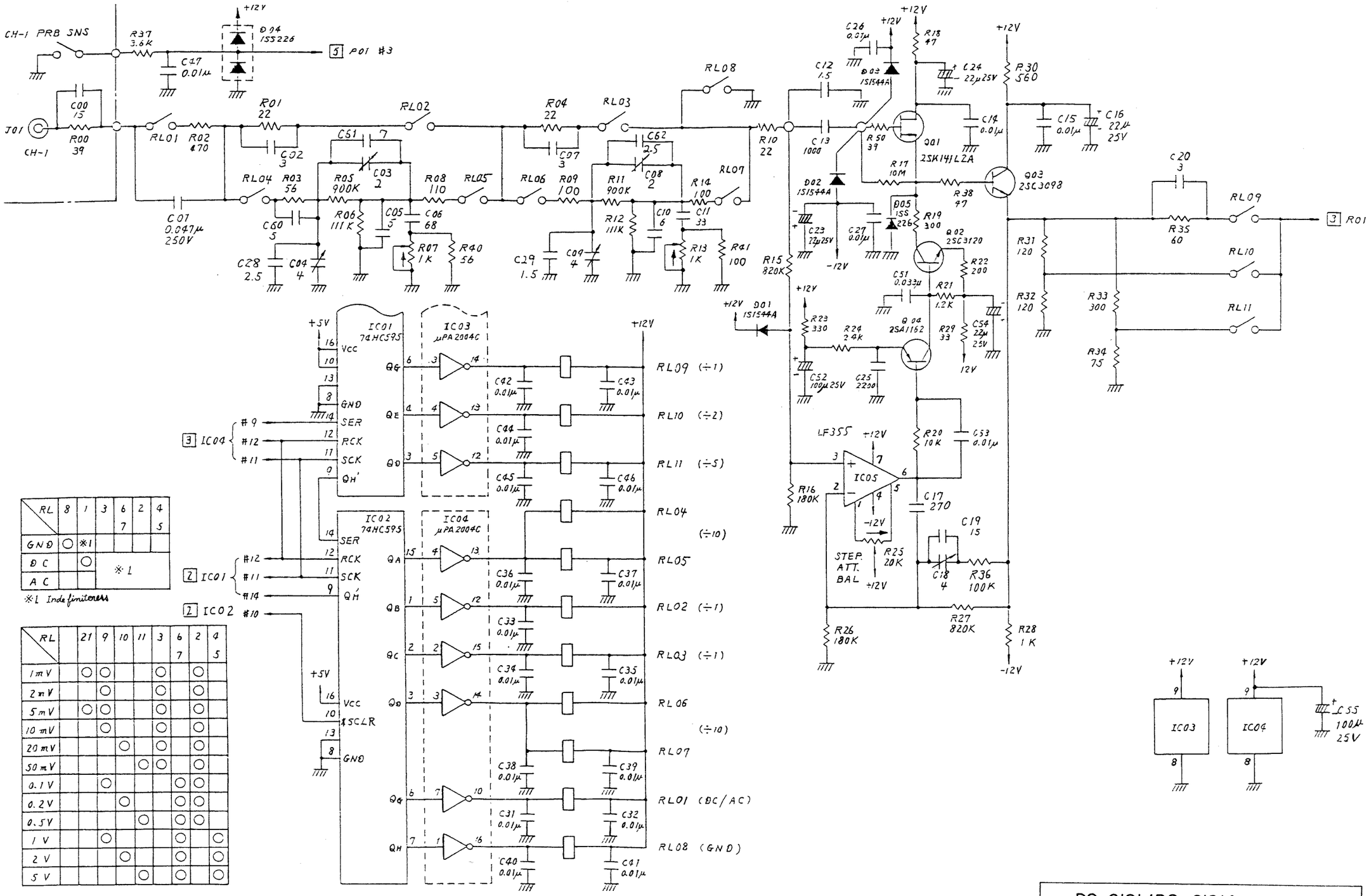
TOP

Rear



Front

Section 5 Schematic Diagrams

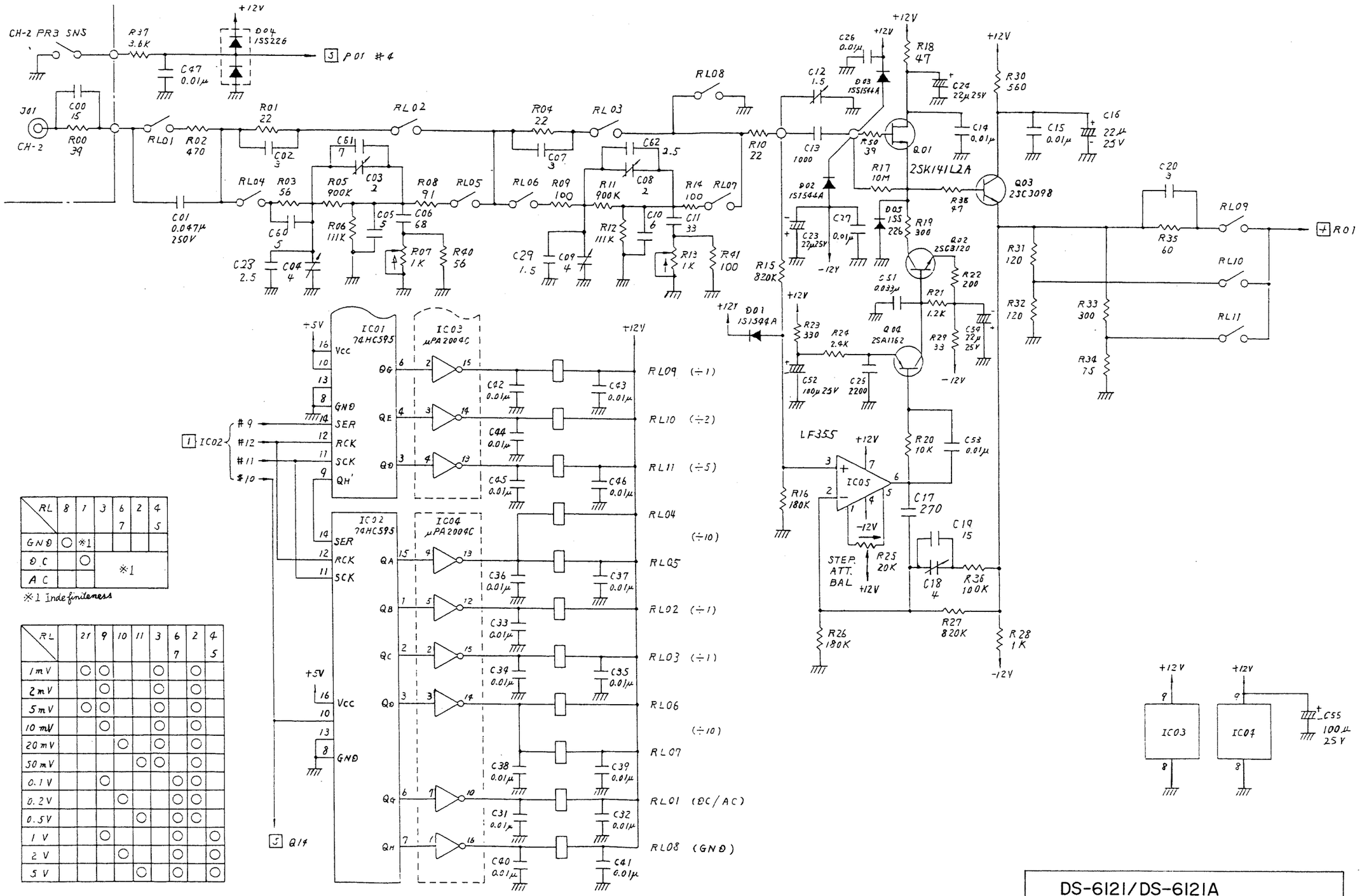


RL	8	1	3	6 7	2	4 5
GND	○	※1				
DC		○	※1			
AC						

※1 Indefiniteness

RL	21	9	10	11	3	6 7	2	4 5
1mV	○	○			○		○	
2mV		○			○		○	
5mV	○	○			○		○	
10mV		○			○		○	
20mV			○		○		○	
50mV				○	○		○	
0.1V		○				○	○	
0.2V			○			○	○	
0.5V				○		○	○	
1V		○				○		○
2V			○			○		○
5V				○		○		○

DS-6121/DS-6121A CH-1 ATT	1
BBWSS24099101	1

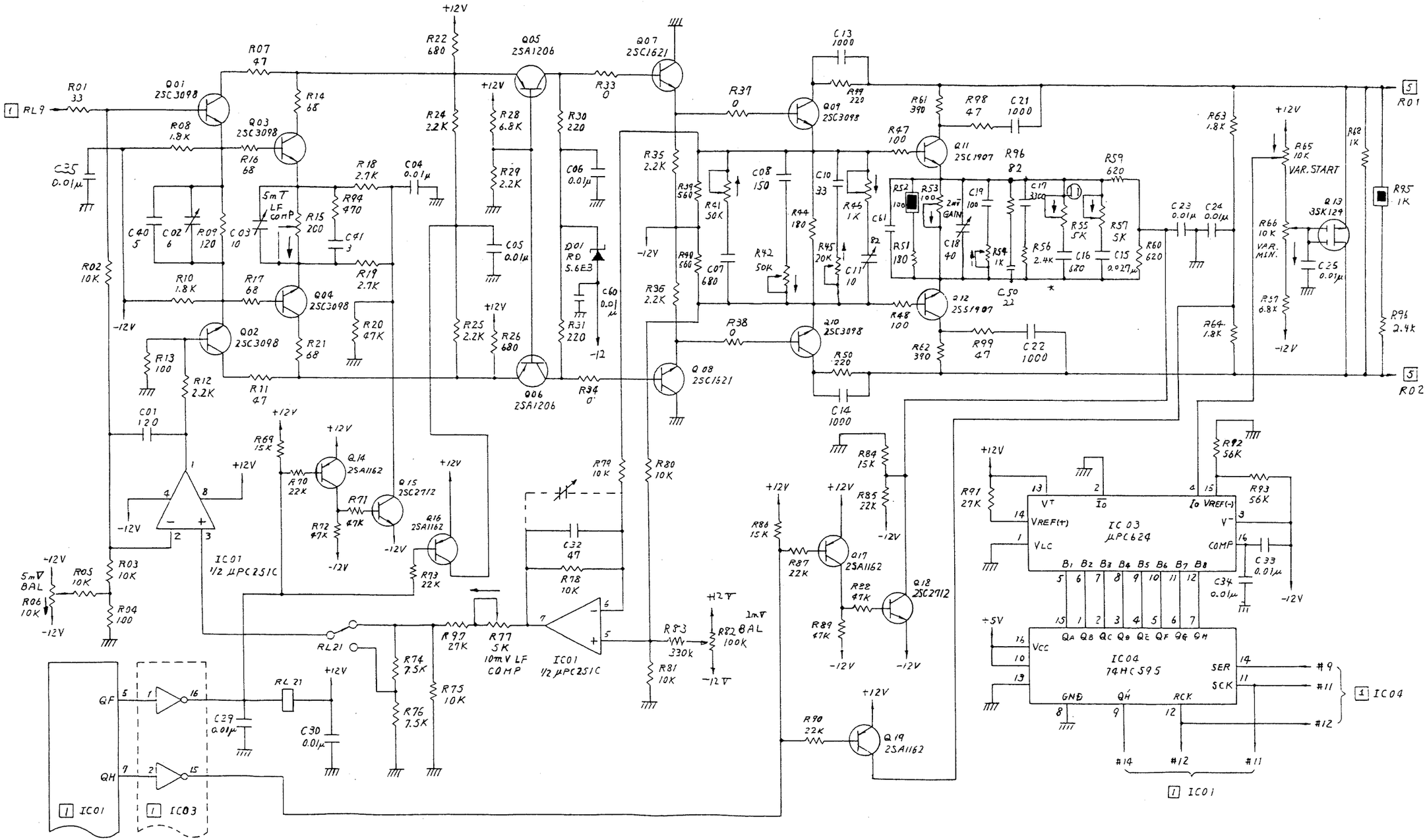


RL	8	1	3	6 7	2	4 5
GND	○	※1				
DC		○	※1			
AC						

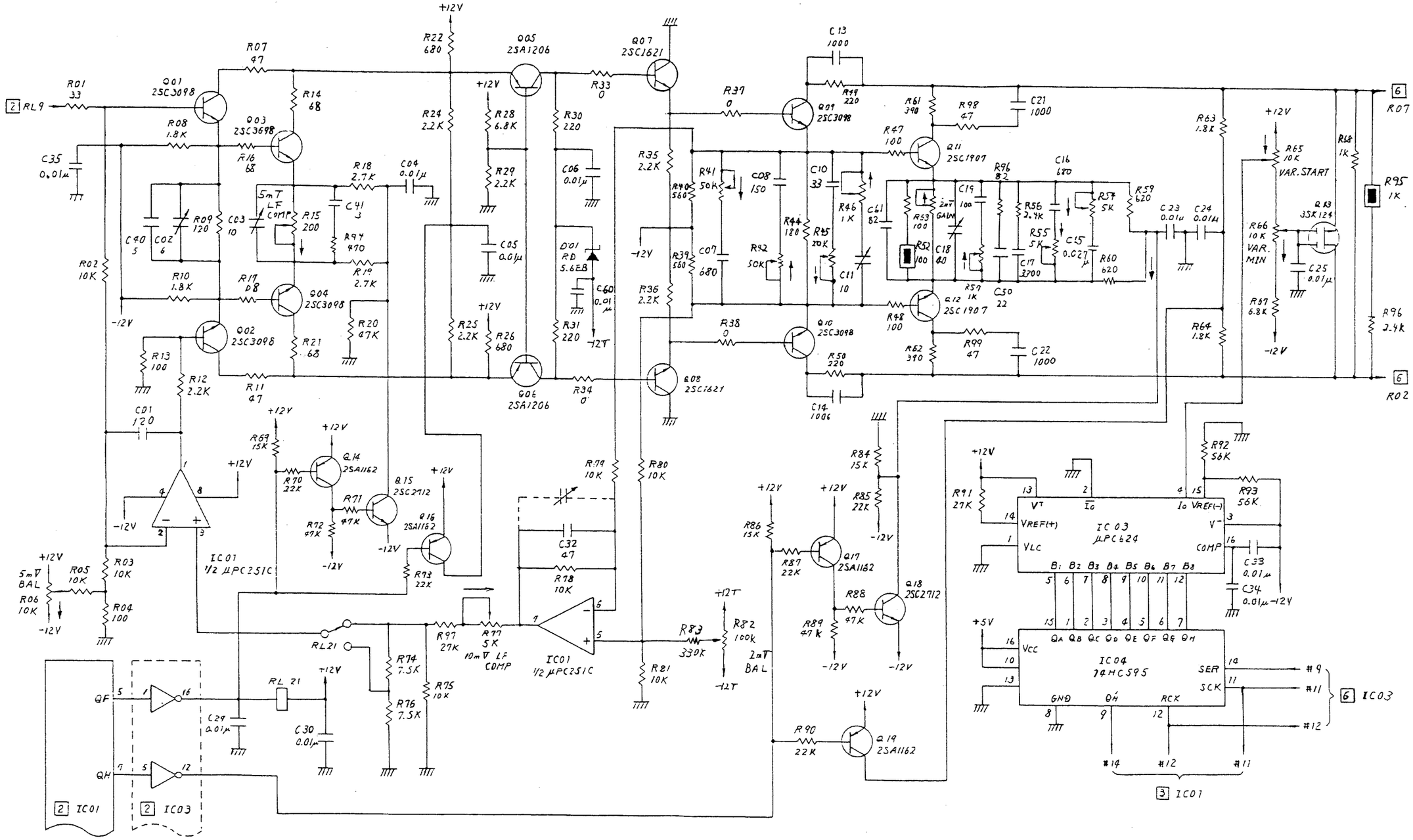
※1 Indefiniteness

RL		21	9	10	11	3	6 7	2	4 5
1mV		○	○			○		○	
2mV			○			○		○	
5mV		○	○			○		○	
10mV			○			○		○	
20mV				○		○		○	
50mV					○	○		○	
0.1V			○				○	○	
0.2V				○			○	○	
0.5V					○		○	○	
1V			○				○		○
2V				○			○		○
5V					○		○		○

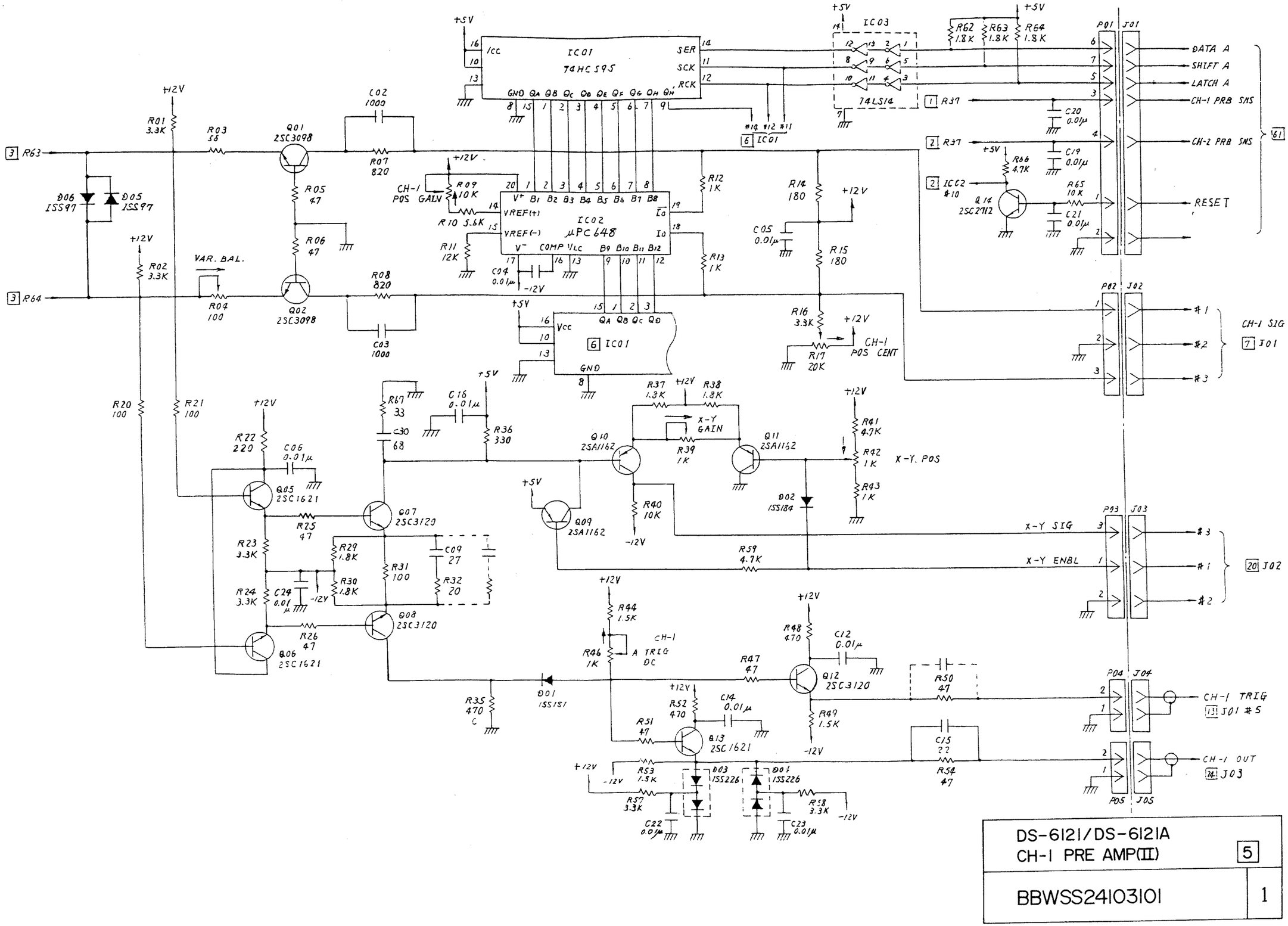
DS-6121/DS-6121A CH-2 ATT	2
BBWSS24100101	1



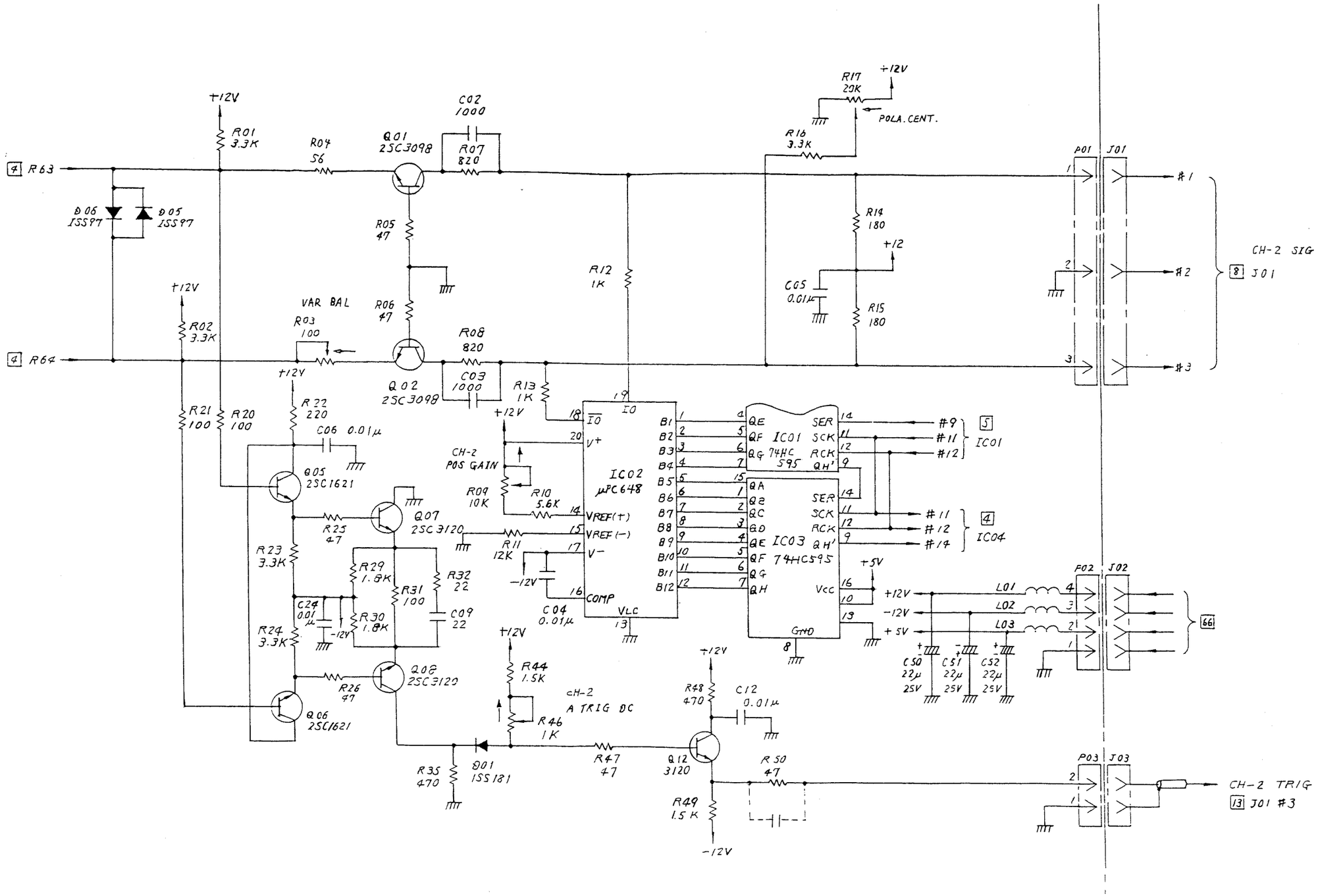
DS-6121/DS-6121A CH-1 PRE AMP(I)	3
BBWSS24101101	1



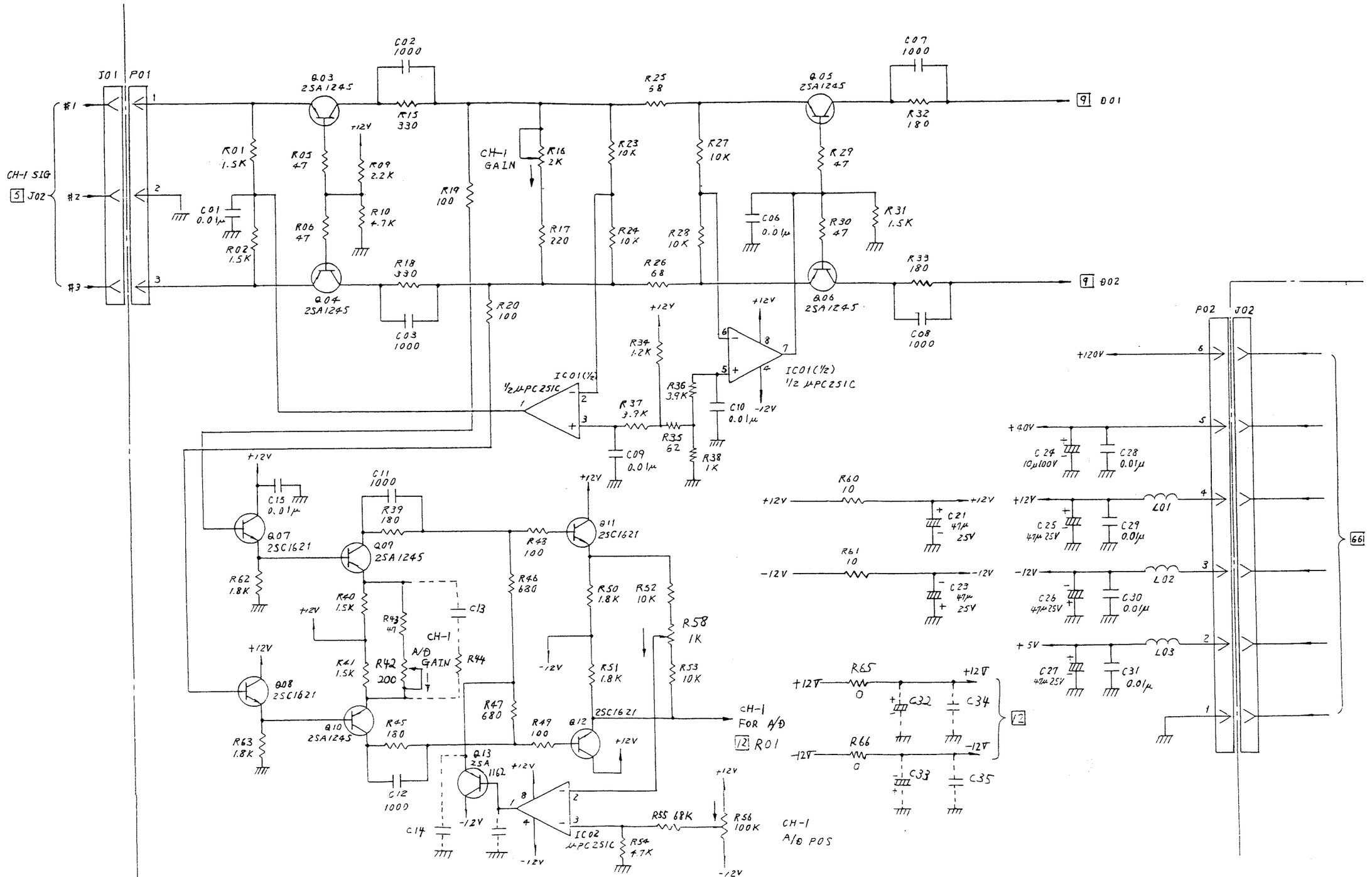
DS-6121/DS-6121A CH-2 PRE AMP(I)	4
BBWSS24102101	1



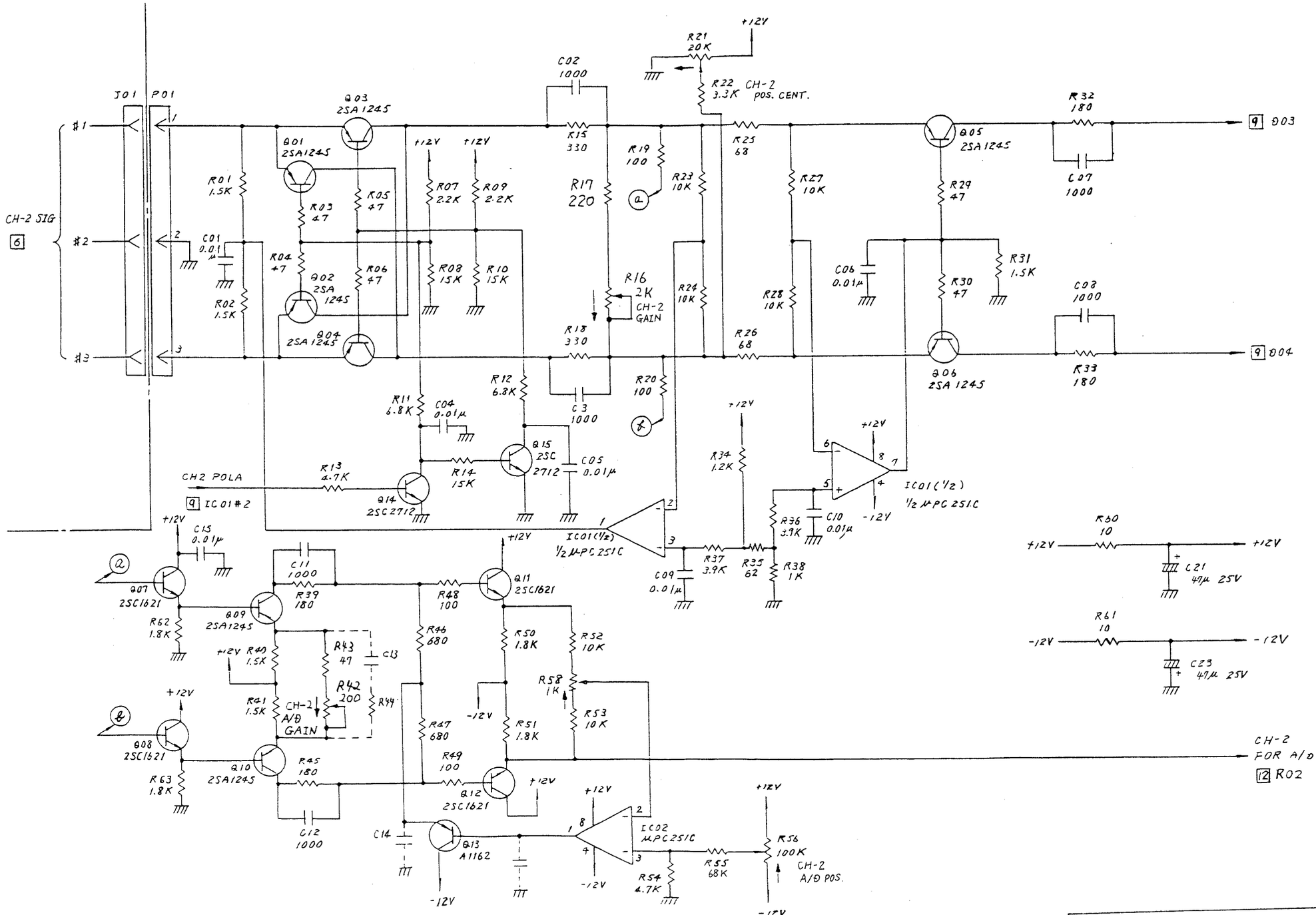
DS-6121/DS-6121A CH-1 PRE AMP(III)	5
BBWSS24103101	1



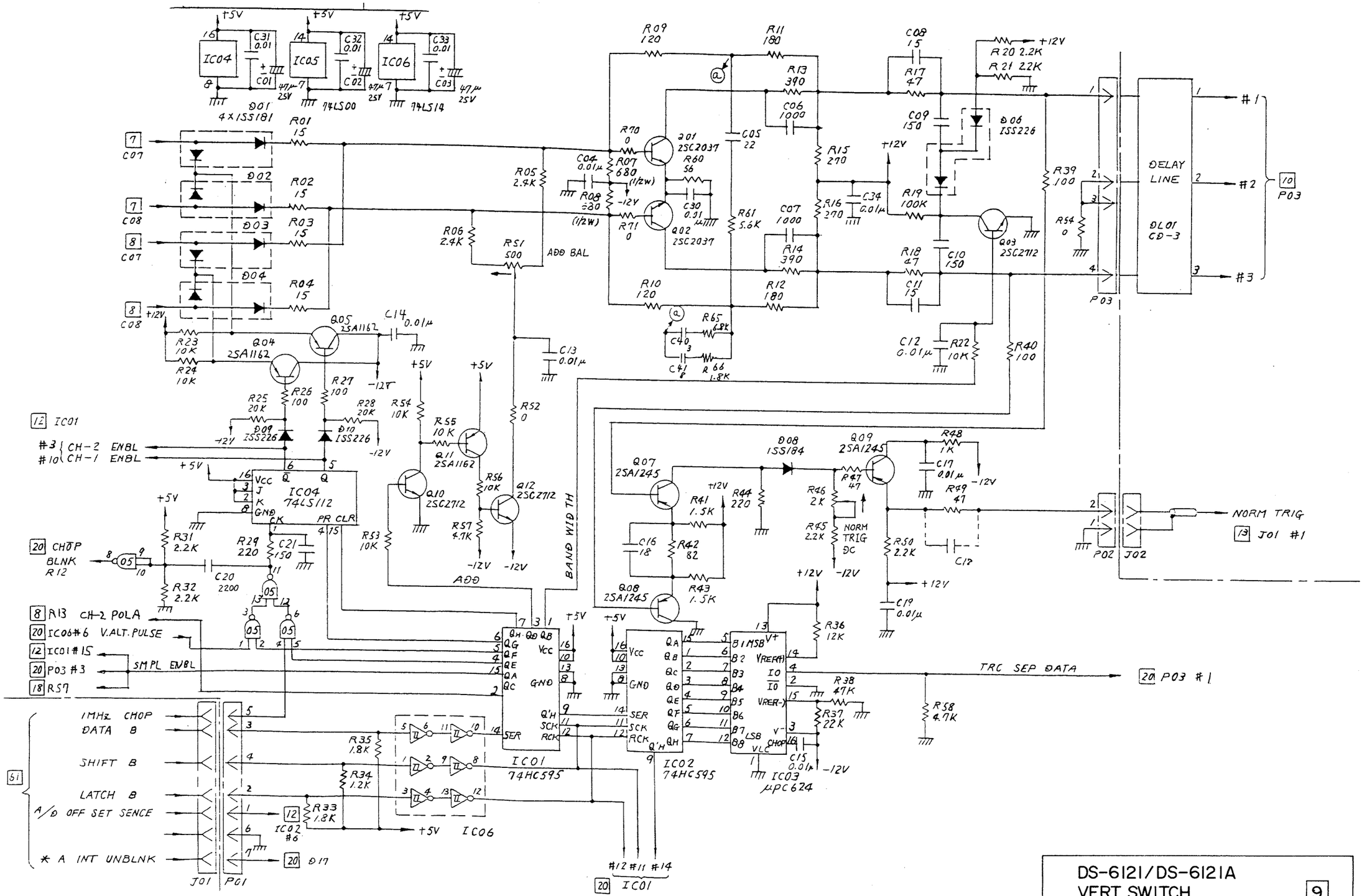
DS-6121/DS-6121A CH-2 PRE AMP(II)	6
BBWSS24104101	1



DS-6121/DS-6121A CH-1 PRE AMP(III)	7
BBWSS24106101	1



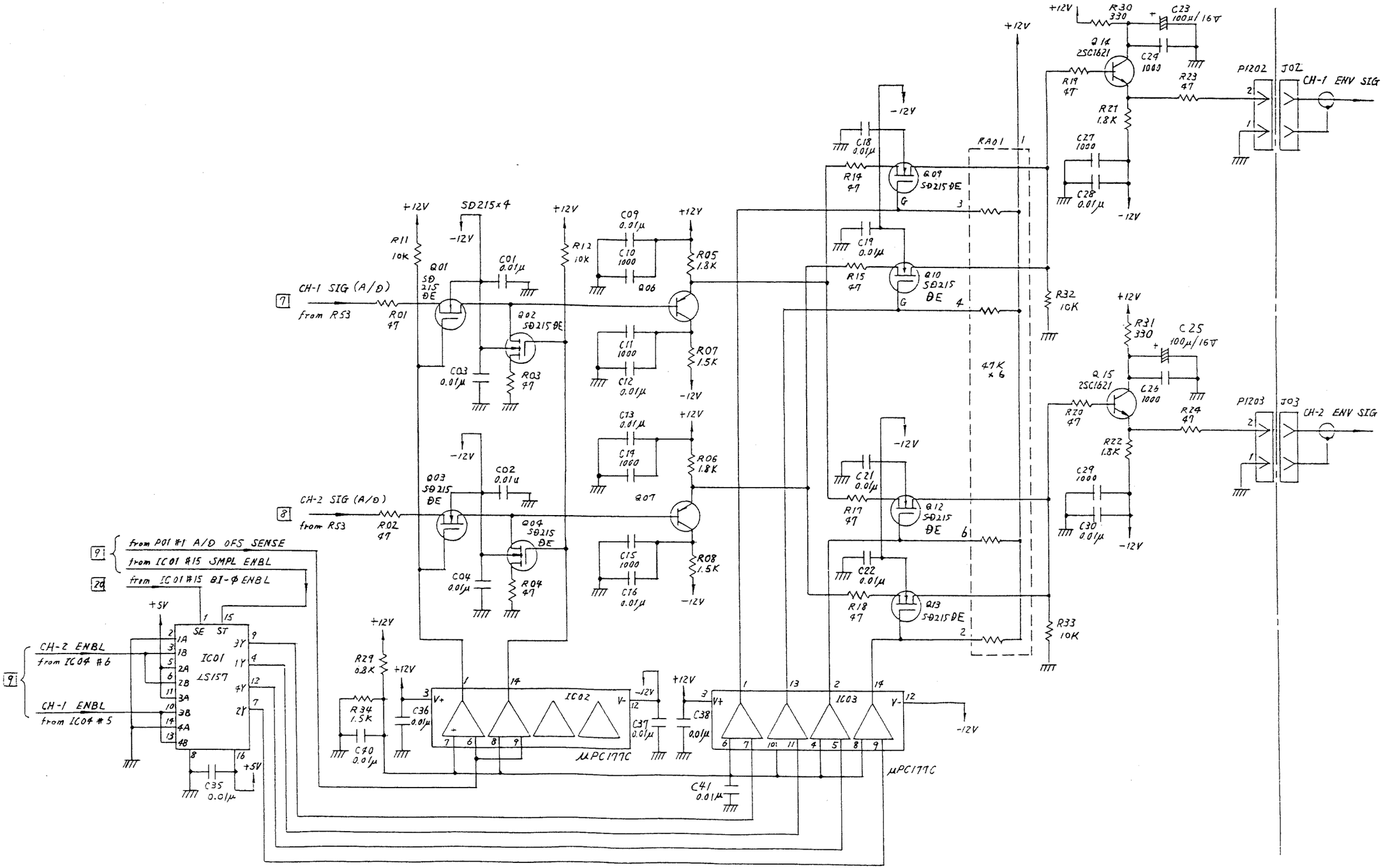
DS-6121/DS-6121A CH-2 PRE AMP(III)	8
BBWSS24107101	1



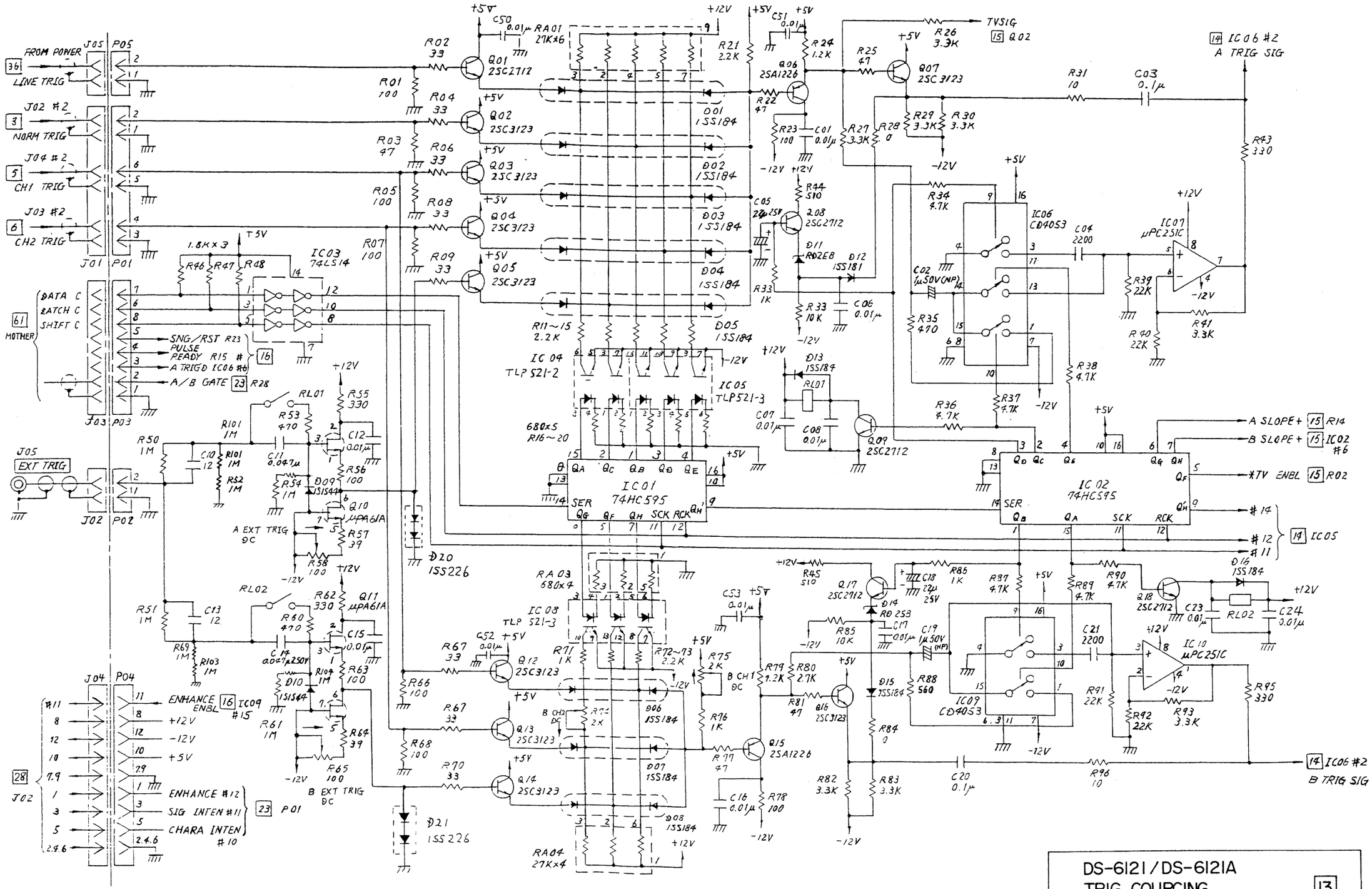
DS-6121/DS-6121A VERT SWITCH	9
BBWSS1003110I	1

DS-6121/DS-6121A
V OUTPUT AMP 10

BBWSS24108101 1



DS-6121/DS-6121A SIG SW FOR ADC	12
BBWSS10032101	1



DS-6121/DS-6121A TRIG COUPCING	13
BBWSS34021101	1

A TRIG PULSE
16 EC01 #15

B TRIG PULSE
23 P01 #8

B TRIG SIG
13 R95

A TRIG SIG
13 R43

IC06 BZ359

IC07 BZ359

+12V
C10 22µ 25V
C15 22µ 25V
C01
C21
R01
R03 10K
R02 20K
A TRIG LEVEL
R04 330
R6 100
C02 0.01µ
R05 1K
R09 100
C04 15
R21 910 ½W
-12V
R10 47
+5V
C11 0.01µ
C12 22µ 25V
C05
C22
R11
R13 10K
R12 20K
B TRIG LEVEL
R14 330
R16 100
C06 0.01µ
R15 1K
R19 100
C08 15
R22 910 ½W
R20 47
C09 0.01µ
C13 22µ 25V

A/B TRIG AMP KILL
15 D01

15 R25

D01 1SS184

D02 1SS184

C14 0.01µ

Q01 2SC2712

Q02 2SC2712

16 IC 09 #2

IC 09 #3

R07 47K
R24 82K
R08 100K
C03 0.01µ

R17 47K
R23 82K
R18 100K
C07 0.01µ

IC01 µPC 648

IC02 µPC 648

IC 03 74HC595

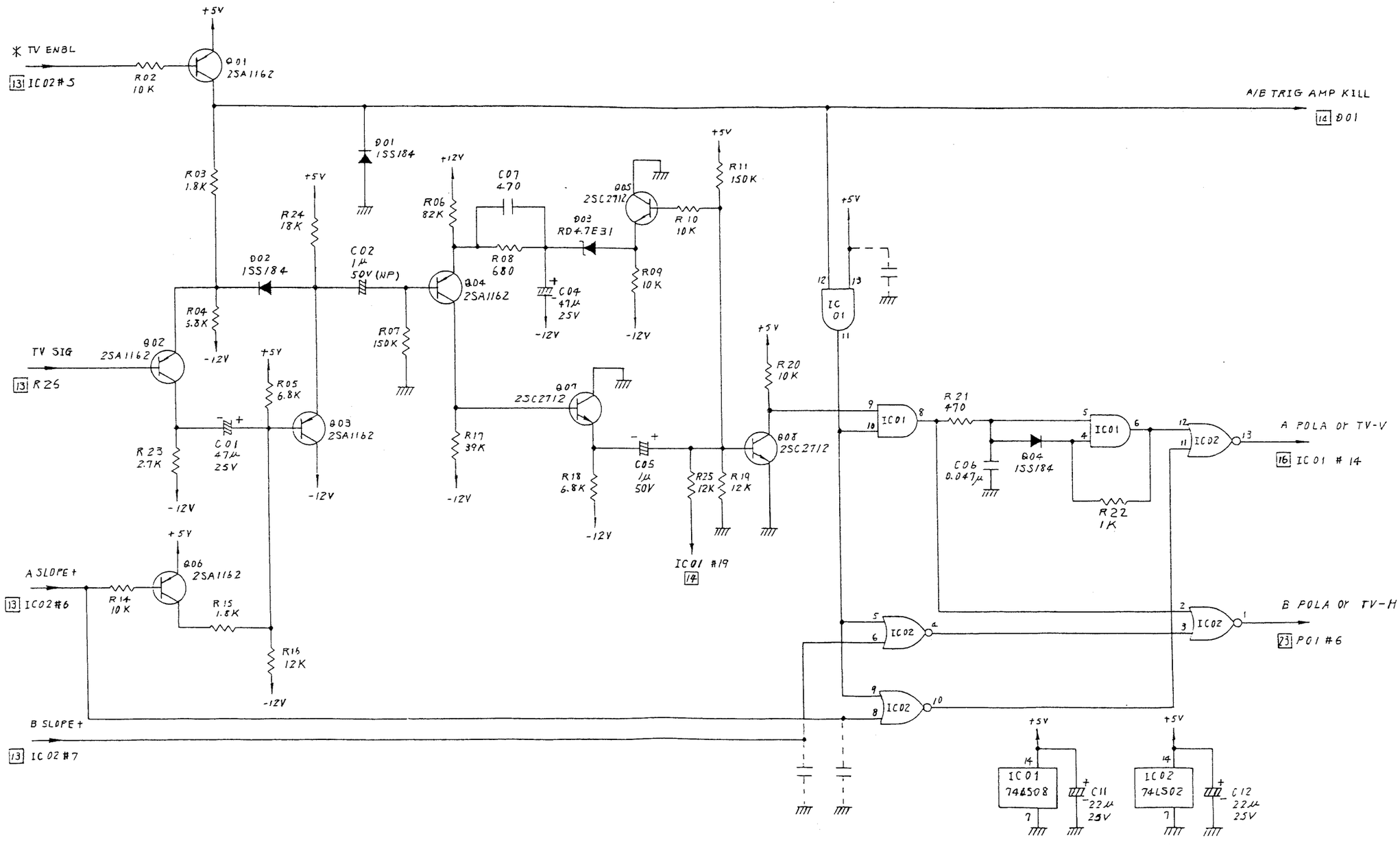
IC 04 74HC595

IC 05 74HC595

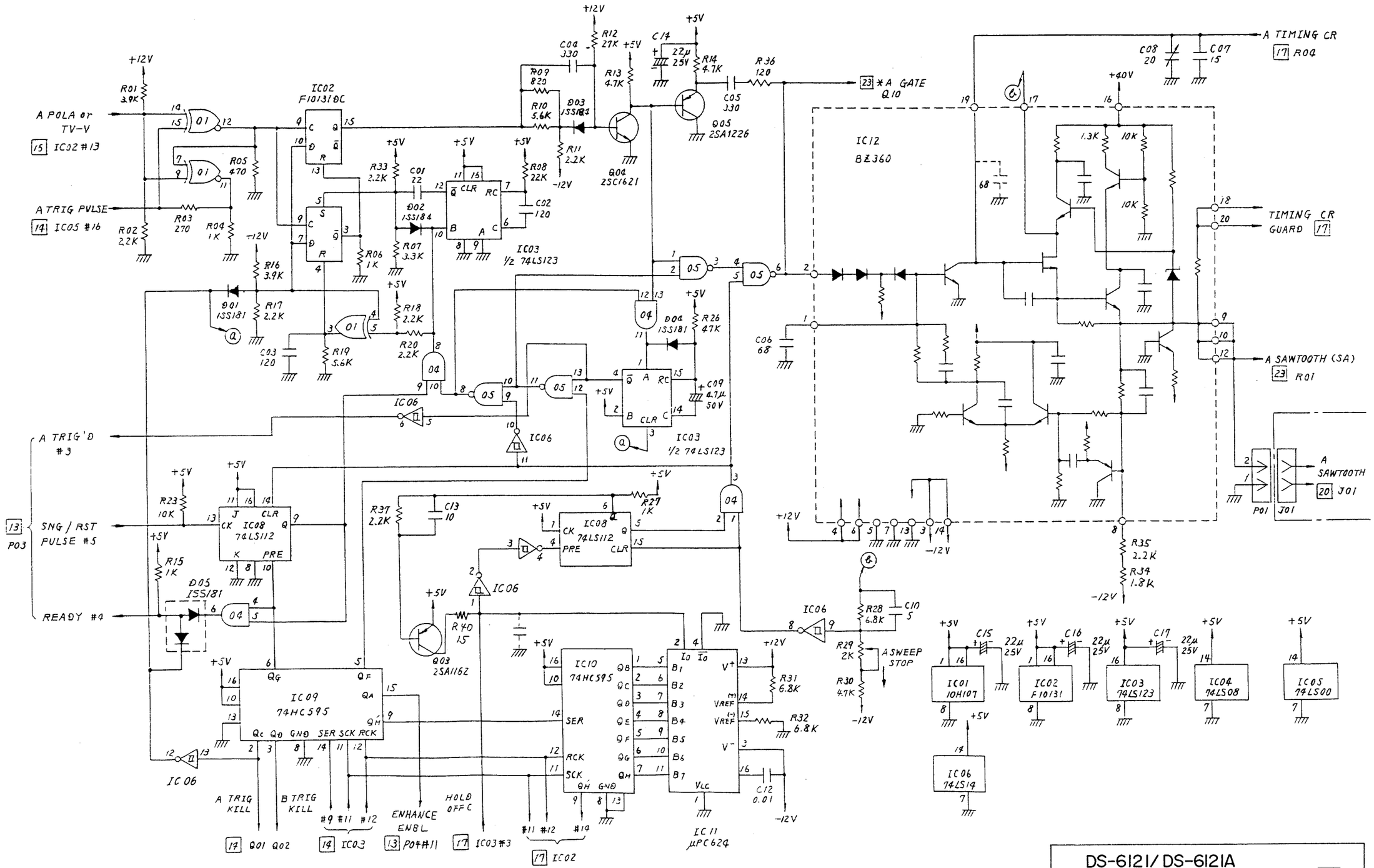
IC09 16 # 14
11
12

9
11
12 13 IC02

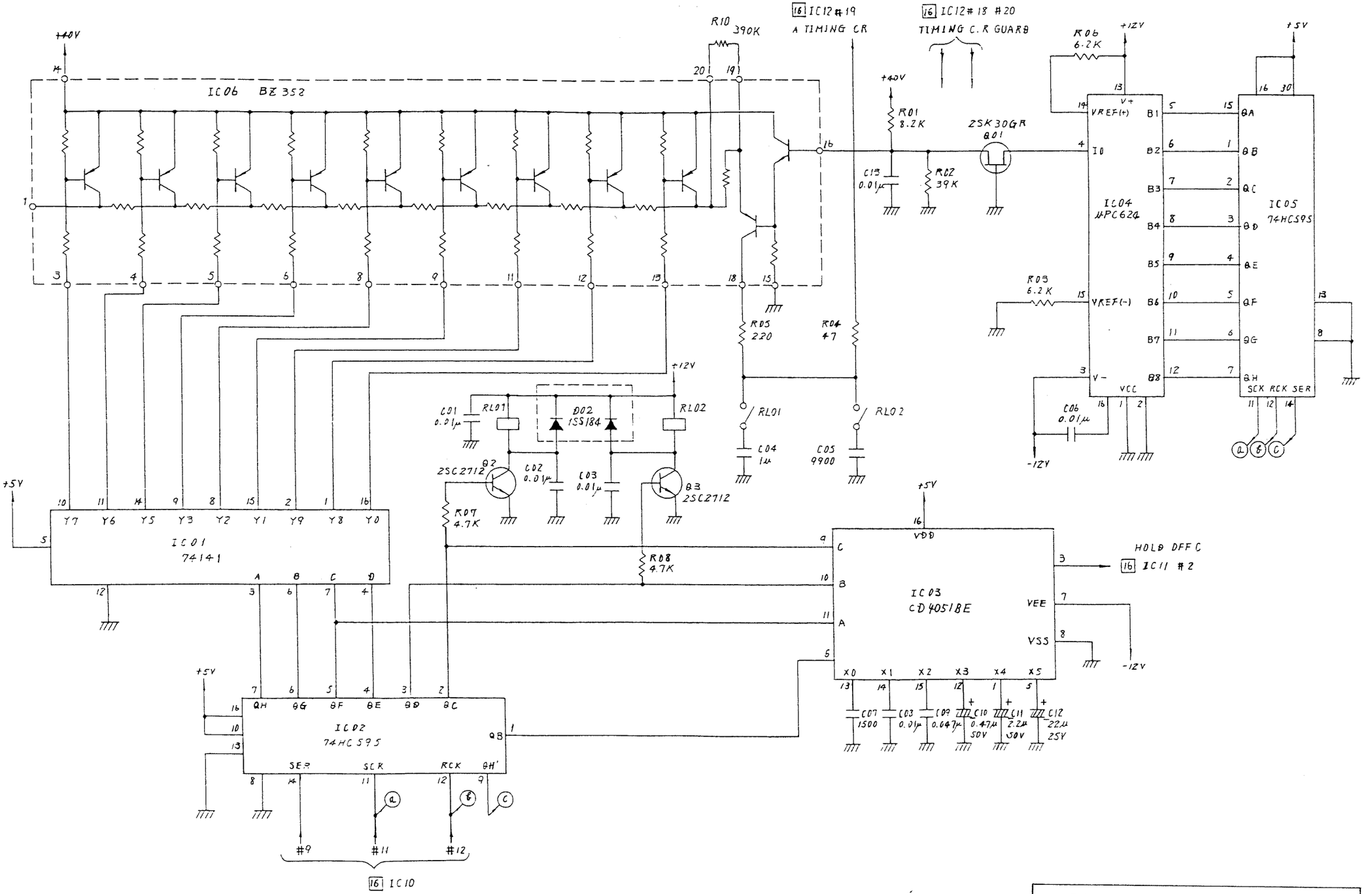
DS-6121/DS-6121A A&B TRIG AMP	14
BBWSS34022101	1



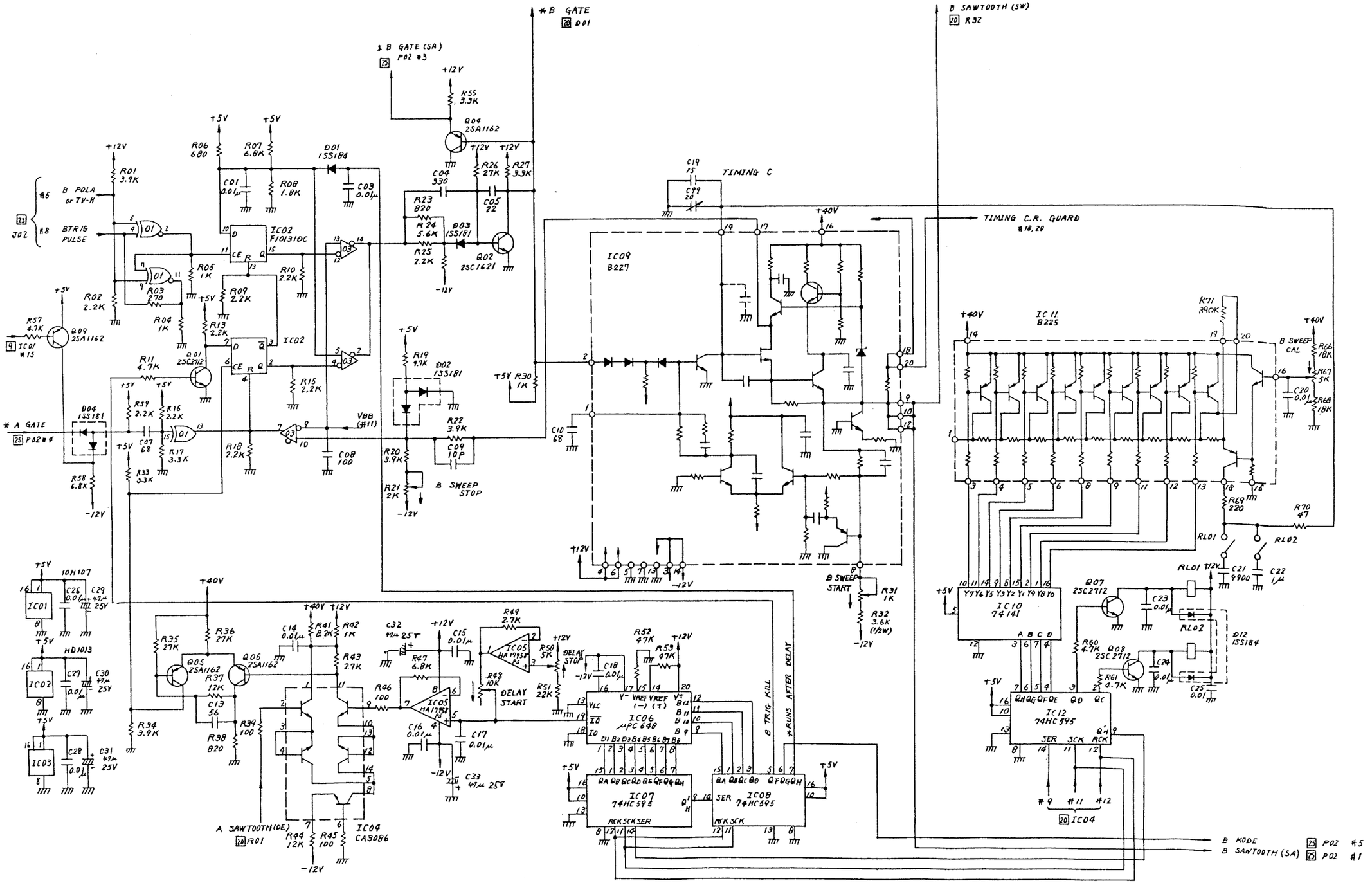
DS-6121/DS-6121A TV SYNC SEPARATOR	15
BBWSS34023101	1



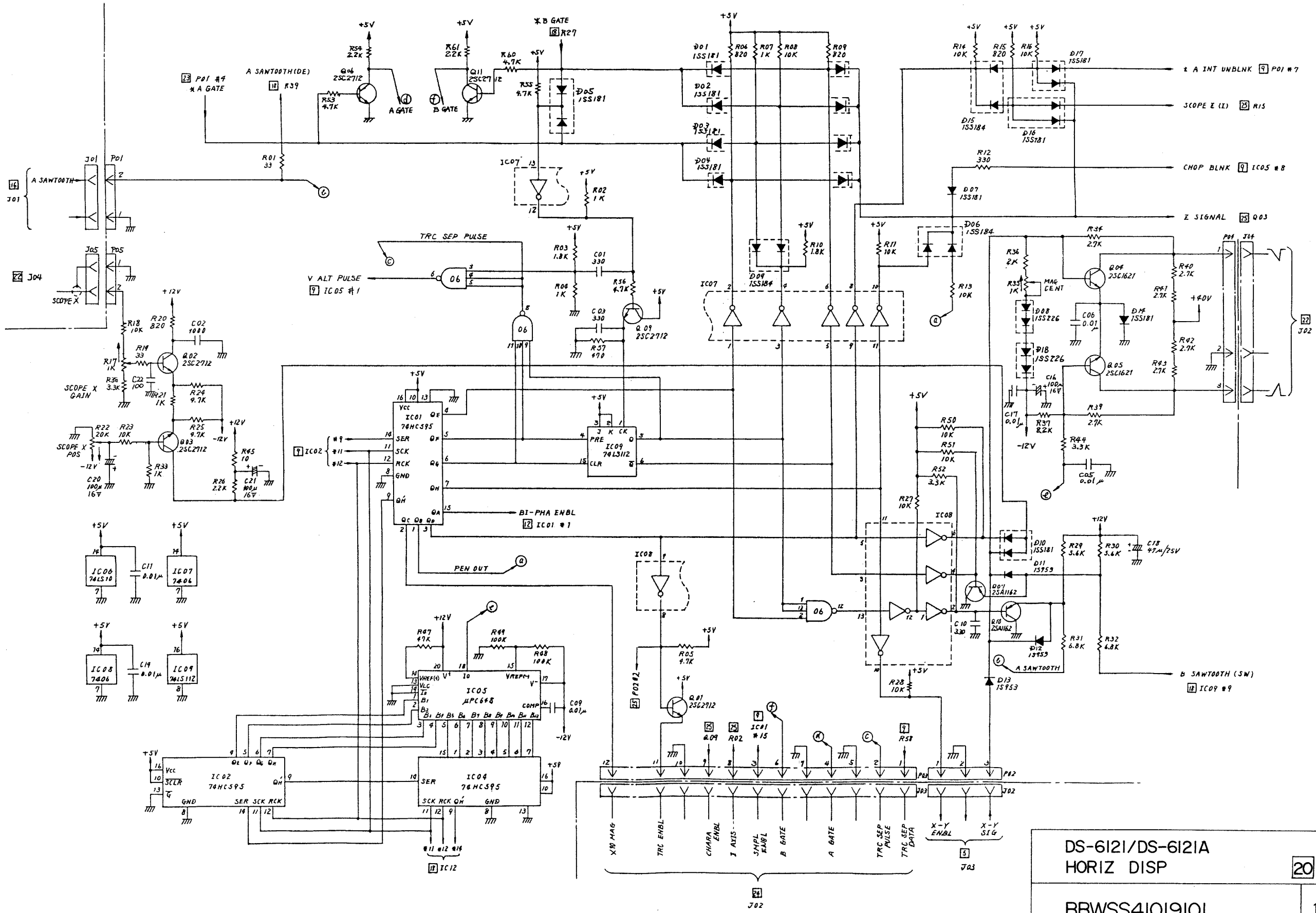
DS-6121/DS-6121A A SWEEP GENERATOR	16
BBWSS20052101	1



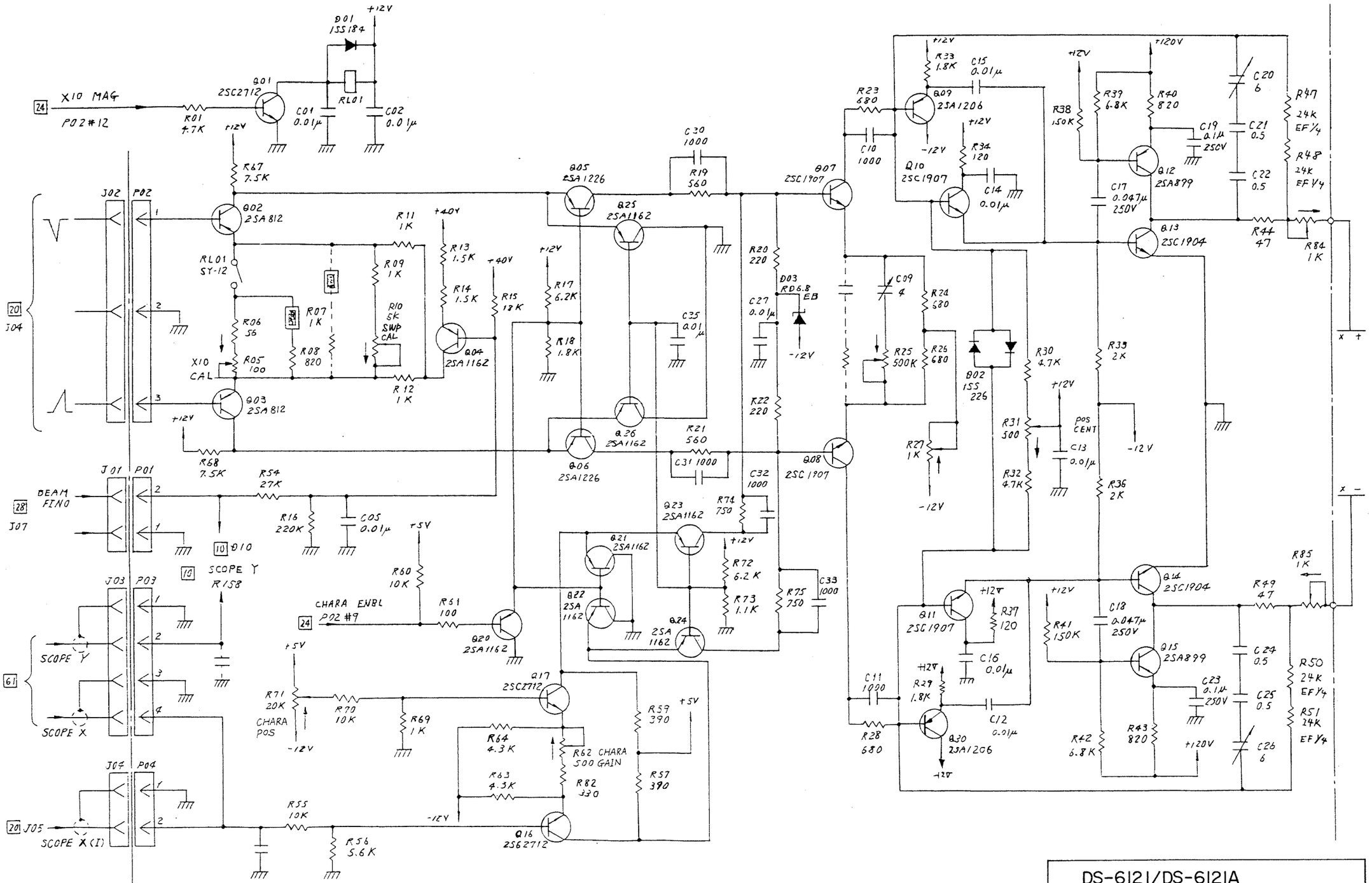
DS-6121/DS-6121A A TIMING CR	17
BBWSS20053101	1



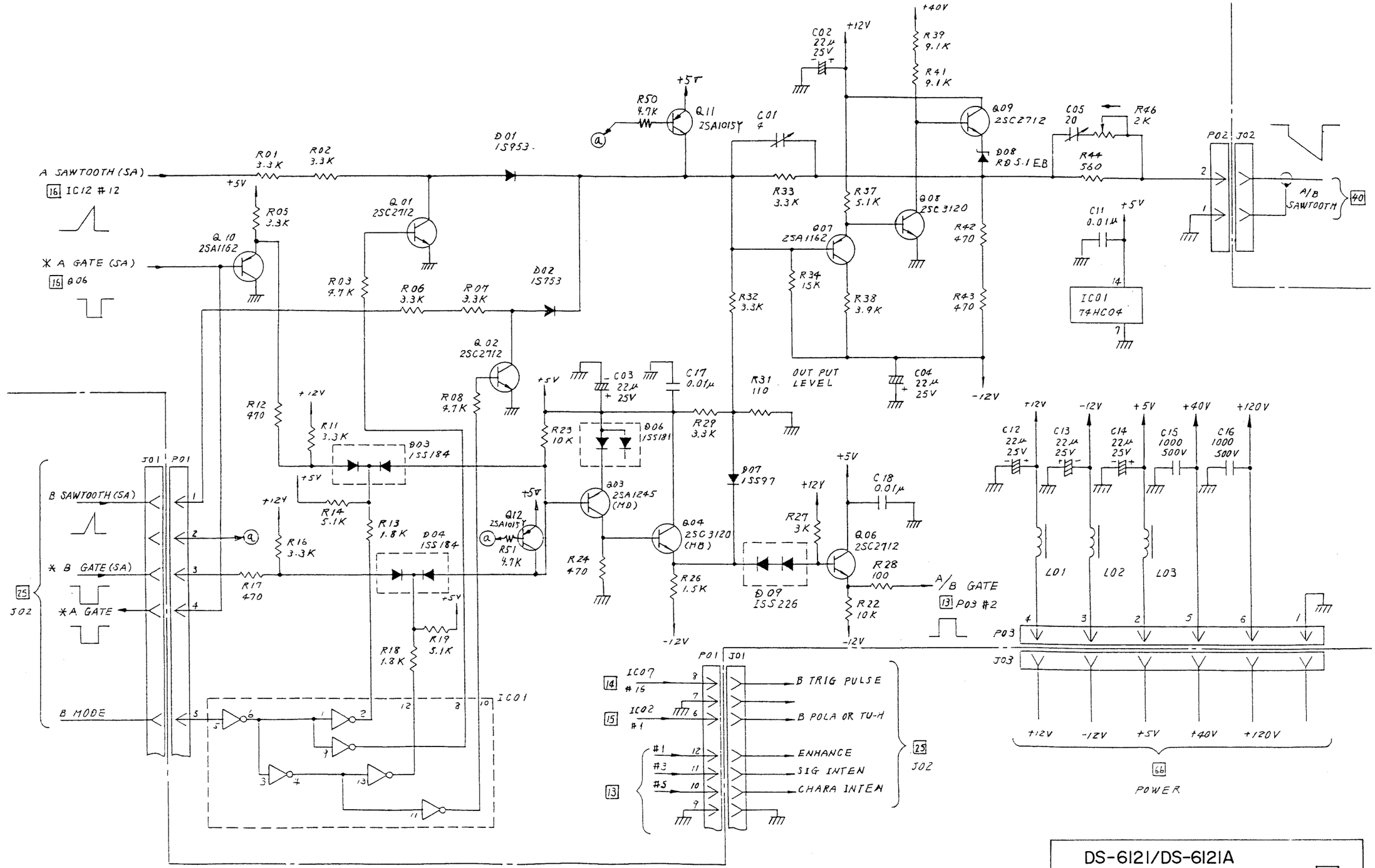
DS-6121/DS-6121A B SWEEP GENERATOR	18
BBWSS20055101	1



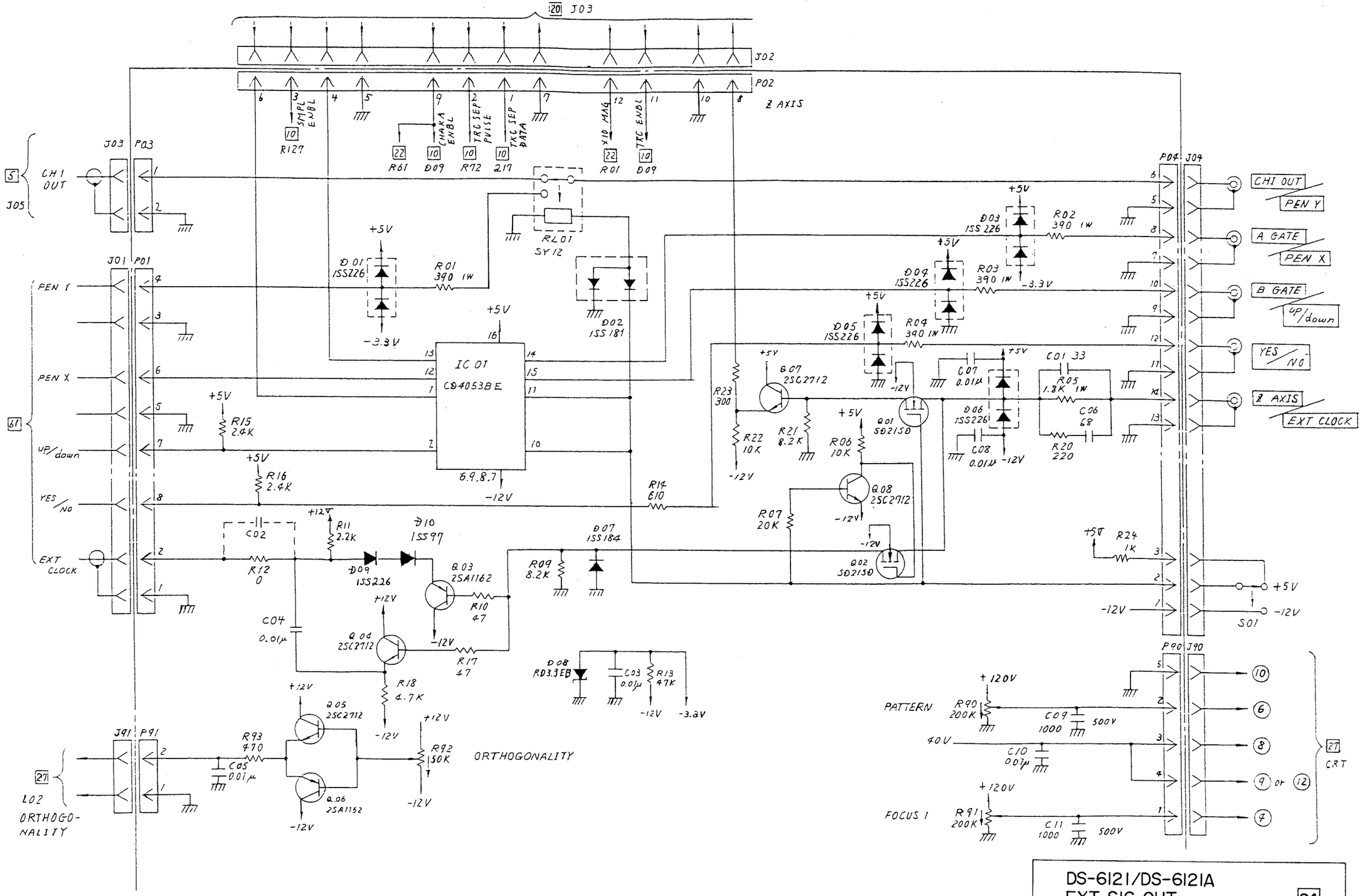
DS-6121/DS-6121A HORIZ DISP	20
BBWSS41019101	1



DS-6121/DS-6121A HORIZ AMP	22
BBWSS2406I101	1

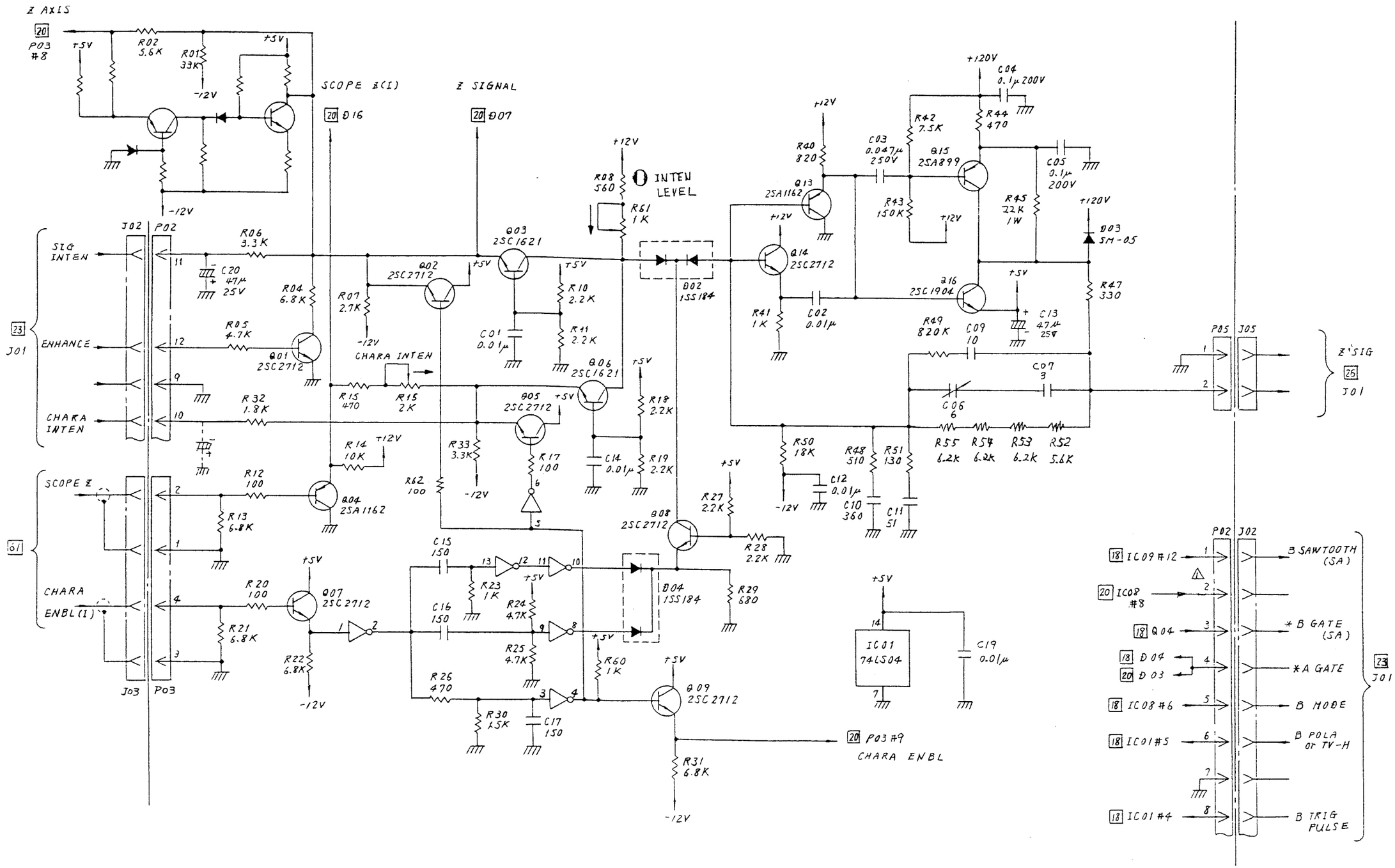


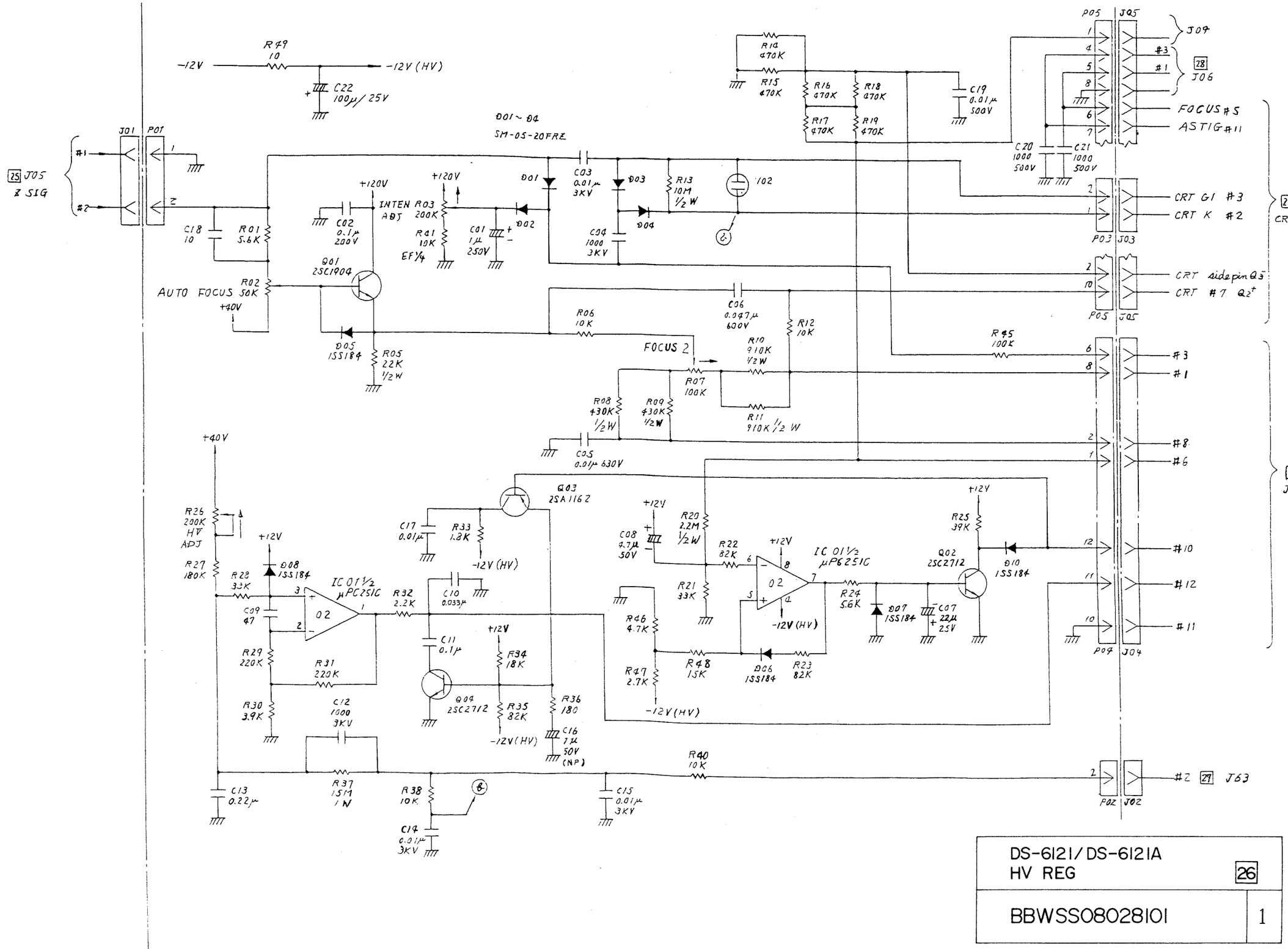
DS-6121/DS-6121A SAWTOOTH OUT(SA)	23
BBWSS20054101	1



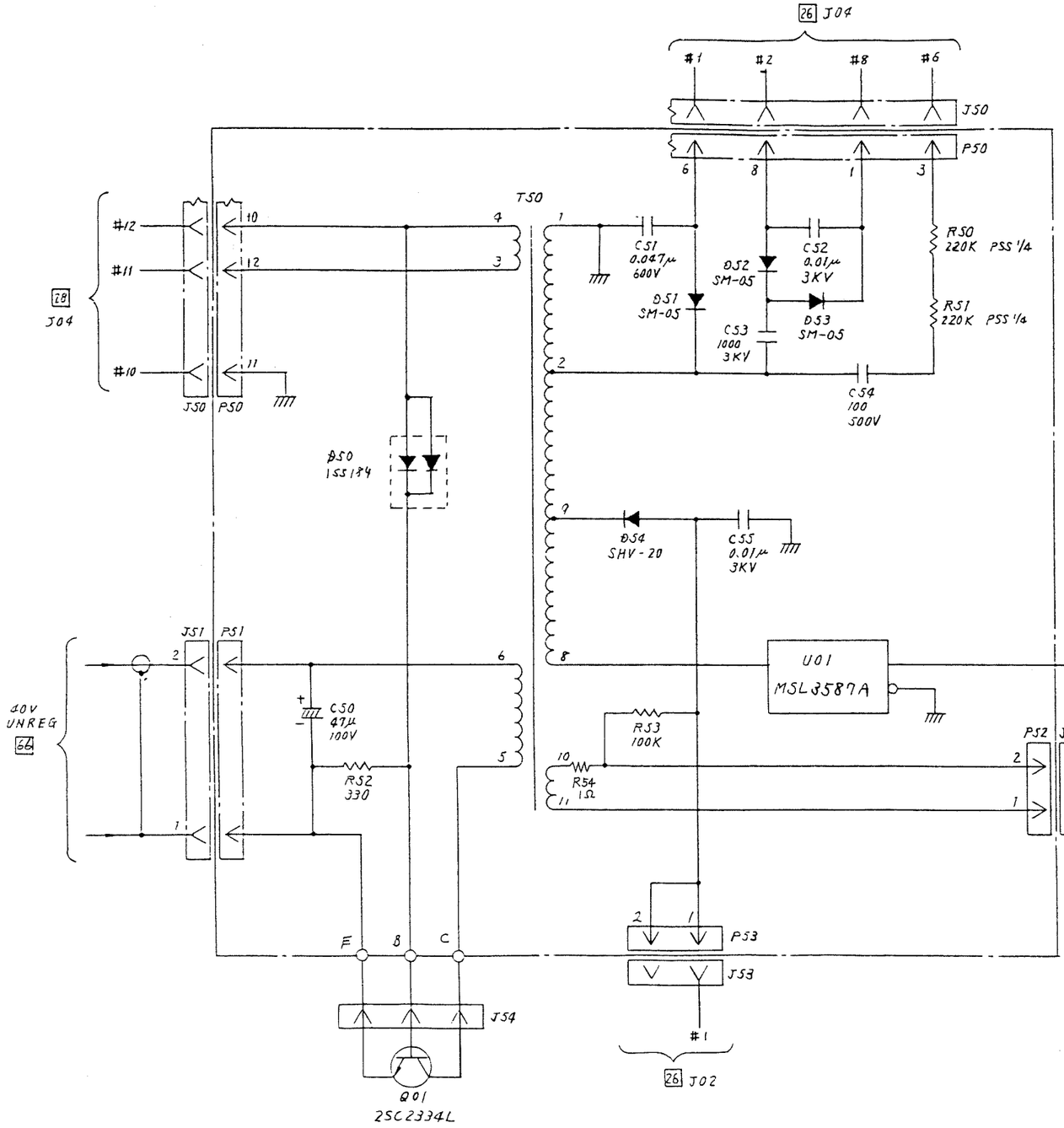
DS-6121/DS-6121A
EXT SIG OUT 24

BBWSS24109101 | 1

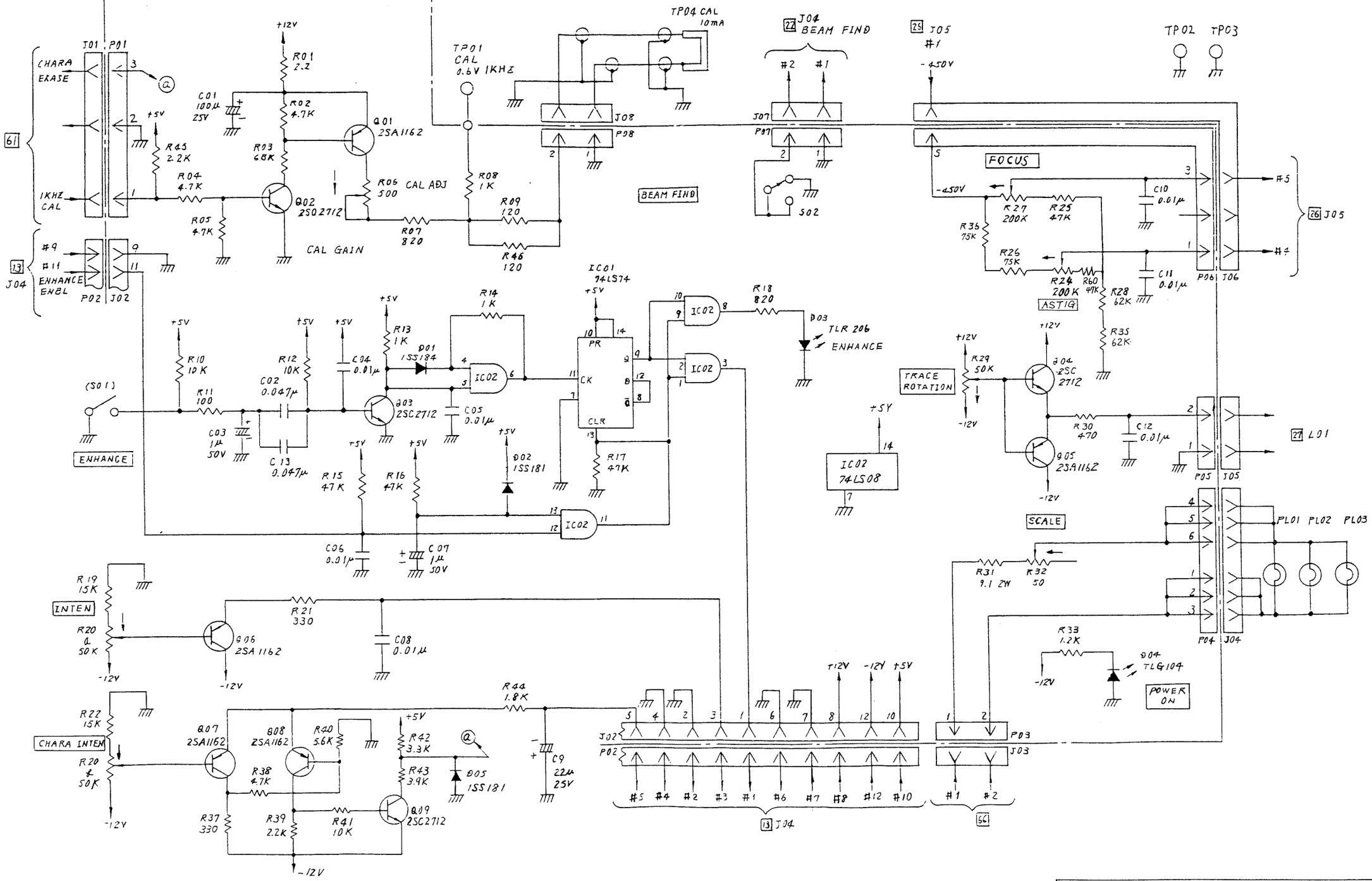

Z AXIS
SCOPE Z(I)
Z SIGNAL
INTEN LEVEL
SIG INTEN
ENHANCE
CHARA INTEN
SCOPE Z
CHARA ENBL(I)
CHARA ENBL
Z SIG
B SAWTOOTH (SA)
* B GATE (SA)
*A GATE
B MODE
B POLA or TV-H
B TRIG PULSE
IC01 74LS04
DS-6121/DS-6121A
Z AMP
25
BBWSS24105101
1



DS-6121/DS-6121A HV REG	26
BBWSS08028101	1



DS-6121/DS-6121A HV	27
BBWSS0802710I	1



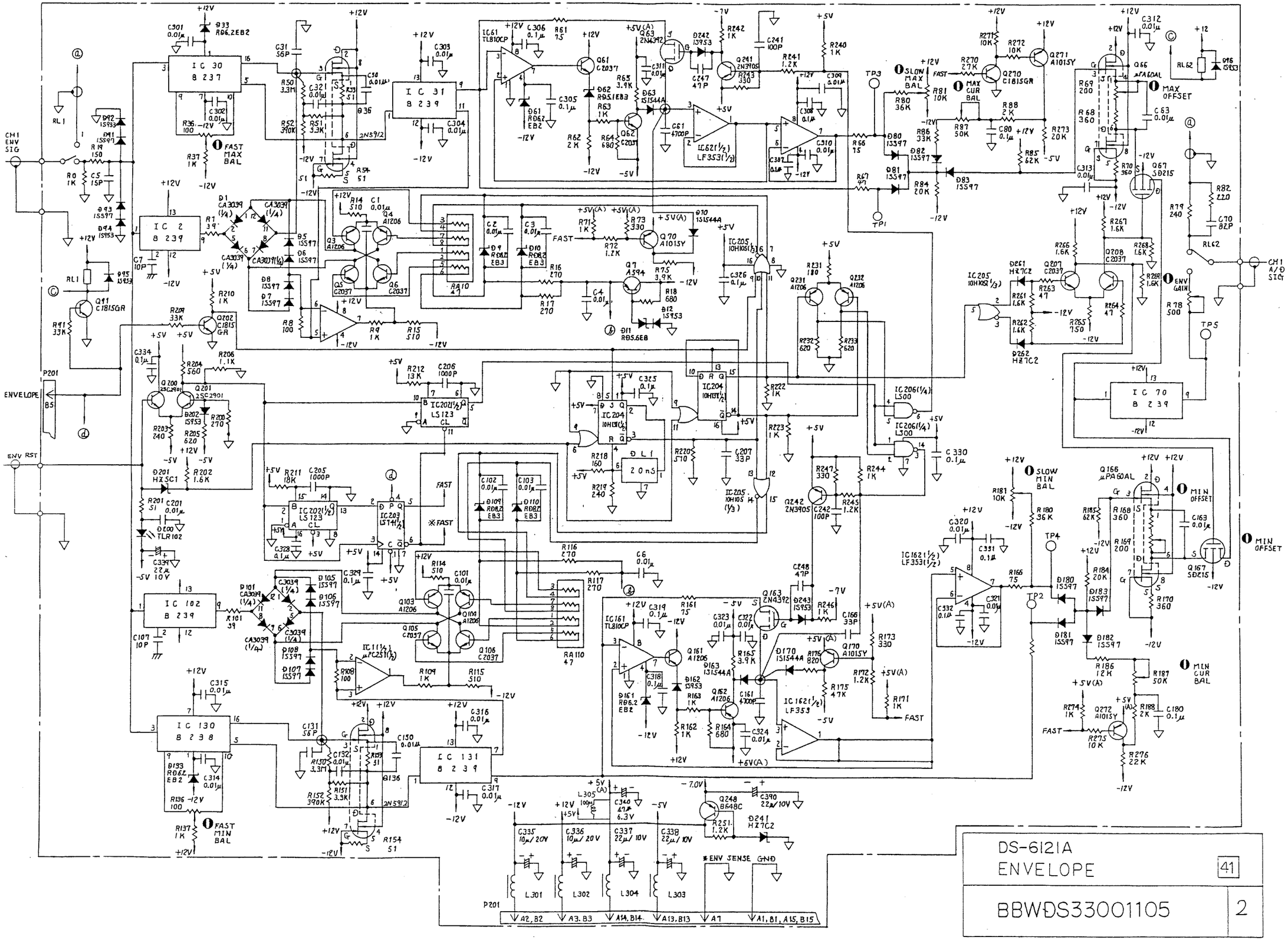
DS-6121/DS-6121A VR CIRCUIT	28
BBWSS40019101	1

DS-6121/DS-6121A
AD CONVERTER

40

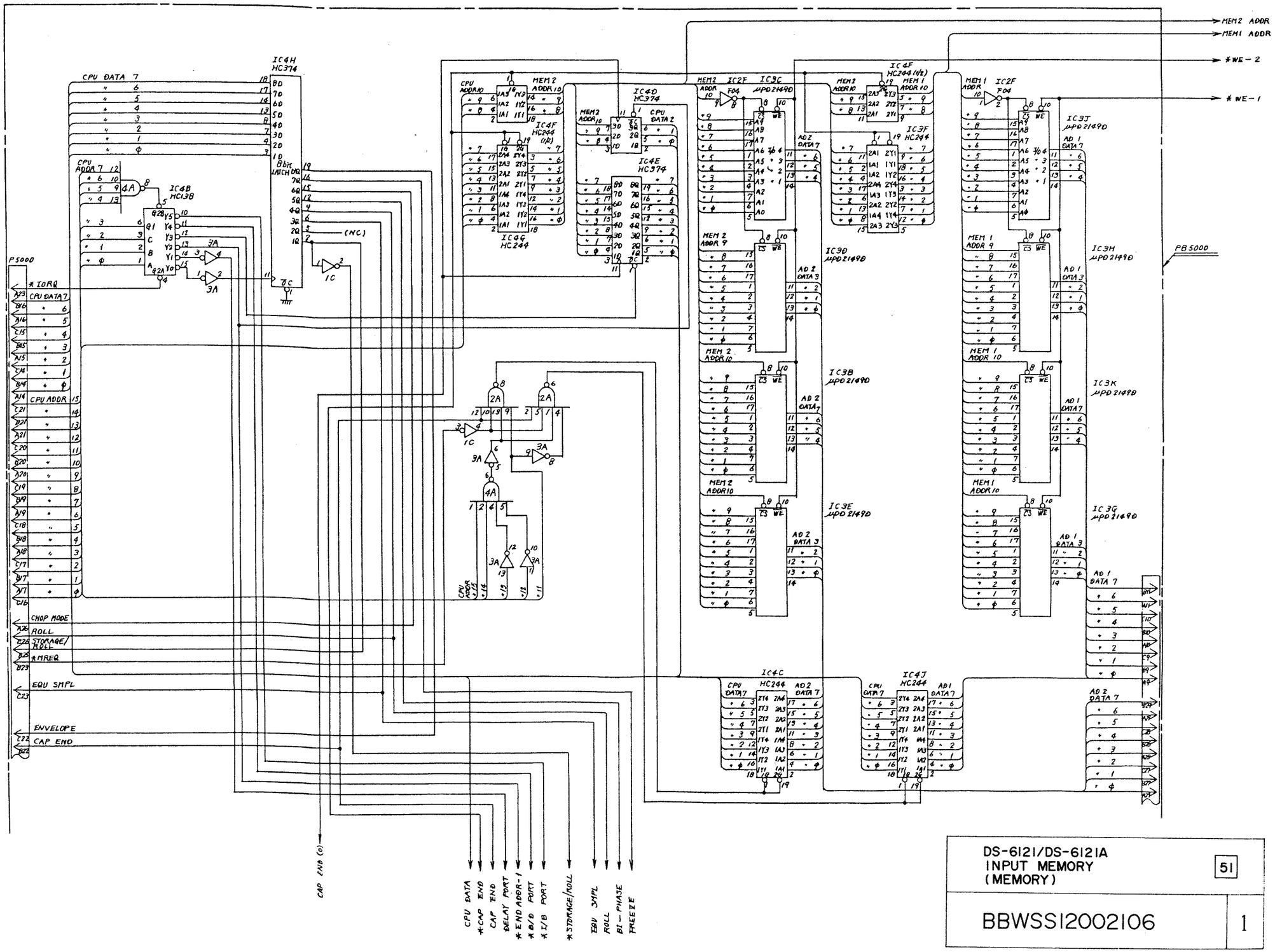
BBWSS22005105

1


CH1 ENV SIG
RL1
FAST MAX BAL
IC 30 8 237
IC 31 8 239
IC 2 8 239
IC 102 8 239
IC 130 8 238
IC 131 8 239
IC 70 8 239
IC161 TL810CP
IC162(1/2) LF353(1/2)
IC205 10H105(1/3)
IC206(1/4) LS00
IC202(1/2) LS123
IC204 10H131(1/2)
IC203 LS74(1/2)
P201
ENVELOPE
ENV RST
FAST MIN BAL
SLOW MAX BAL
MAX CUR BAL
MAX OFFSET
SLOW MIN BAL
MIN OFFSET
MIN CUR BAL
ENV GAIN
TP1
TP2
TP3
TP4
TP5
L301
L302
L304
L303
ENV SENSE GND
A2, B2
A3, B3
A14, B14
A13, B13
A7
A1, B1, A15, B15
DS-6121A
ENVELOPE
41
BBWDS33001105
2

DELAY PORT
Q5000 2SC2901
R5000 10K
R5001 10K
Q5001 2SC2901
* I/B PORT
* B/B PORT
EQU SMPL
* TRIG READY
* TRIG INHIBIT
* B/B END
A/B GATE
3NG/RST PULSE
EQU SMPL GATE
NO OFFSET SENSE
BI-PHASE
CLOCK-1
* INT-IN
CLOCK-2
* TRIG'D
* WRITE BUSY
L 5000
K5T4-8-2 (BT)
GND (BGL)
P5000
C5000 0.1μ
C5001 22μ 10V
C5002 0.1μ
C5010, 13~15, 33~45 0.01μ (18T)
C5011, 12, 16~32 0.1μ (19T)
C5051 270P
C5052 150P
C5053 270P
C5054 20P
C5050 100P
R5000 200
B5001 1S953
B5002 1S953
B5000 1S953
(1/6) RA5000 4.7K
(1/4) RA5000 4.7K
PB5000
* WE-1
* WE-2
* TRIG READY
MEM 1 ADDR
MEM 2 ADDR
CPU DATA
BI-PHASE
ROLL
* STORAGE/ ROLL FREEZE
(TOP VIEW)
* END ADDR-1
CAP END(O)
* CAP END
CAP END
DELAY-LINE (ADL-025S)
DELAY (74LS31)

DS-6121/DS-6121A INPUT MEMORY I (MEMORY CONTROL)	50
BBWSS120021105	1



DS-6121/DS-6121A INPUT MEMORY (MEMORY)	51
BBWSS12002106	1

PB5200

J5201

CH1 CLOCK

CH2 CLOCK

PS200

BI-PHASE

STORAGE/ROLL

CHOP MODE

1MHz CHOP

1KHz CAL

EXT CLOCK

*EQU SMPL CLOCK

CLOCK-1

CLOCK-2

*ENV SENSE

CPU DATA

*KEY CONT PORT

X5200 40MHz OSC

RA5200 (1/2)

RA5201 (1/2)

RS282 1K

RS200 4.7K

RS201 4.7K

RS270 4.7K

RS280 240K

RS274 220

RS381 5.1K

C5270 1000

C5271 1000

C5280 3.3μ/16V

C5273 47P

C5274 120

IC1F 10124

IC2F 10H171

IC2D 10125

IC1D 10H158

IC3G 5196

IC10F HC123

IC10C HC174

IC9F HC125(1/2)

IC10F HC123(1/2)

IC10B HC74

IC10H HC74

IC9J HC151

IC9G HC153

IC10J HC393

IC9H HC138

IC8G HC390

IC8H HC390

IC8J HC390

LS390

LS374A

HC08

HC125

L5200 KST4-8-2(8T)

L5290 KST4-8-2(8T)

C5212,14,19,25 --- 1000P (x4)
C5230,38,39,41~43---0.01μ (x6)
C5211,13,18,24,27~29,
31~37,40,44~51 ---0.1μ (x23)

C5215,16,20,23 1000P (x4)
C5217,21,22,26 0.1μ (x4)

C5200 0.1μ

C5201 0.1μ

C5202 22μ 10V

C5290 0.1μ

C5291 0.1μ

C5292 22μ 10V

+5V

-5V

2MHz

1MHz

4M

400K

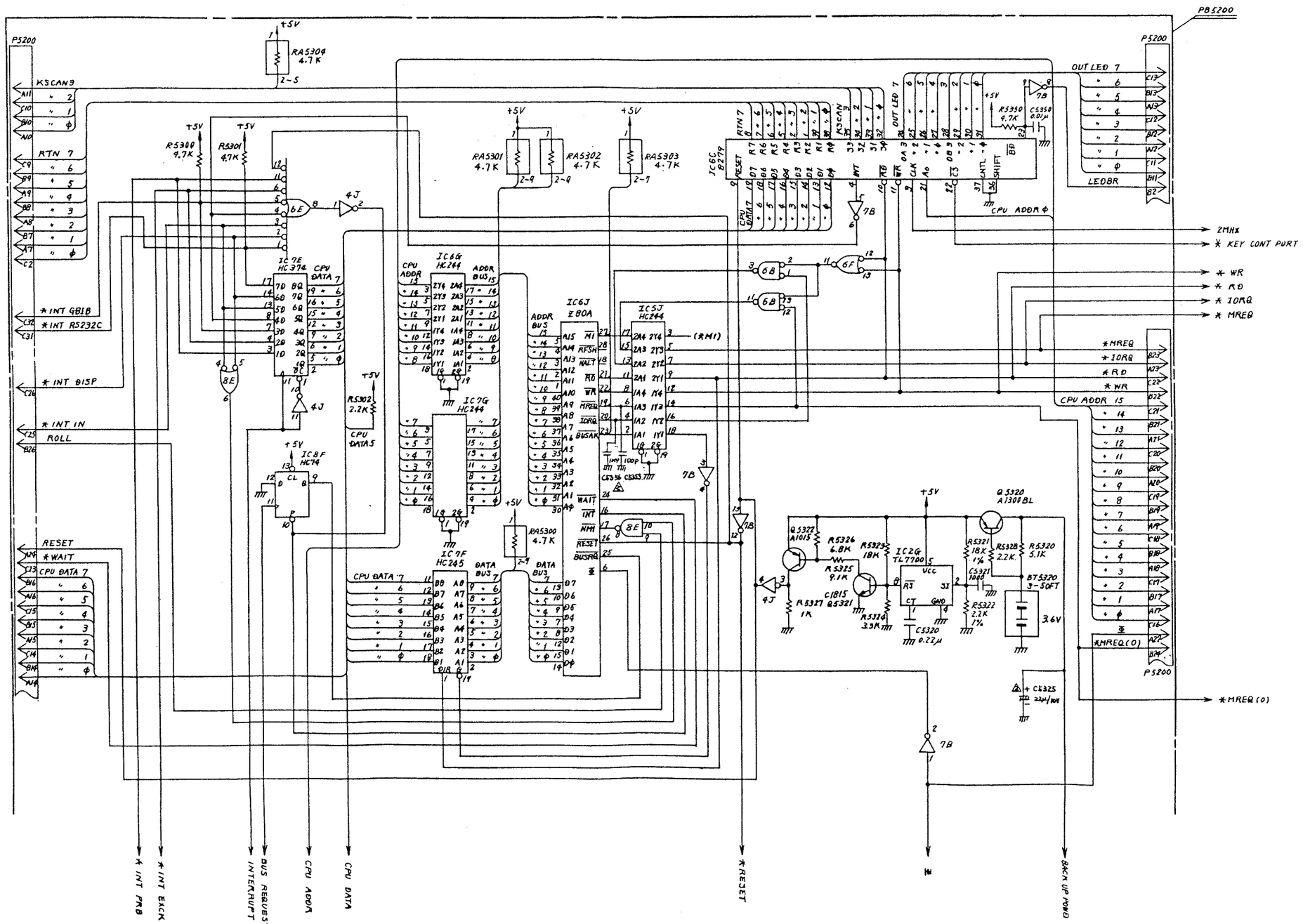
40K

4K

400

40

DS-6121/DS-6121A CPU CIRCUIT (CLOCK GEN.)	52
BBWSS10014105	1



DS-6121/DS-6121A CPU CIRCUIT II (CPU)	53
BBWSS10014106	1

P85200

P5200

CH1 PRB SNS

CH2 PRB SNS

IC9D HC74

IC9E HC74

IC8F HC74

IC9F HC125 (1/3)

CPU DATA 1

IC8B HC138

IC8A HC174

IC9A HC174

IC10A HC174

LATCH (A)

SHIFT (A)

DATA (A)

LATCH (B)

SHIFT (B)

DATA (B)

LATCH (C)

SHIFT (C)

DATA (C)

CPU DATA 2

*IORQ

INTERRUPT

BUS REQUEST

IC5H HC154

IC5C 27256

IC5E 27256

IC5F 27256

IC3C 6264L

IC3E 6264L

IC3F 6264L

CPU ADDR 15

CPU ADDR 11

CPU ADDR 10

CPU ADDR 12

CPU DATA 7

CPU DATA 6

IC10B HC74

RA5900 4.7K

*INT PRB

CPU DATA

CPU ADDR

*RD

*WR

*MREQ (0)

*MREQ

BACK UP POWER

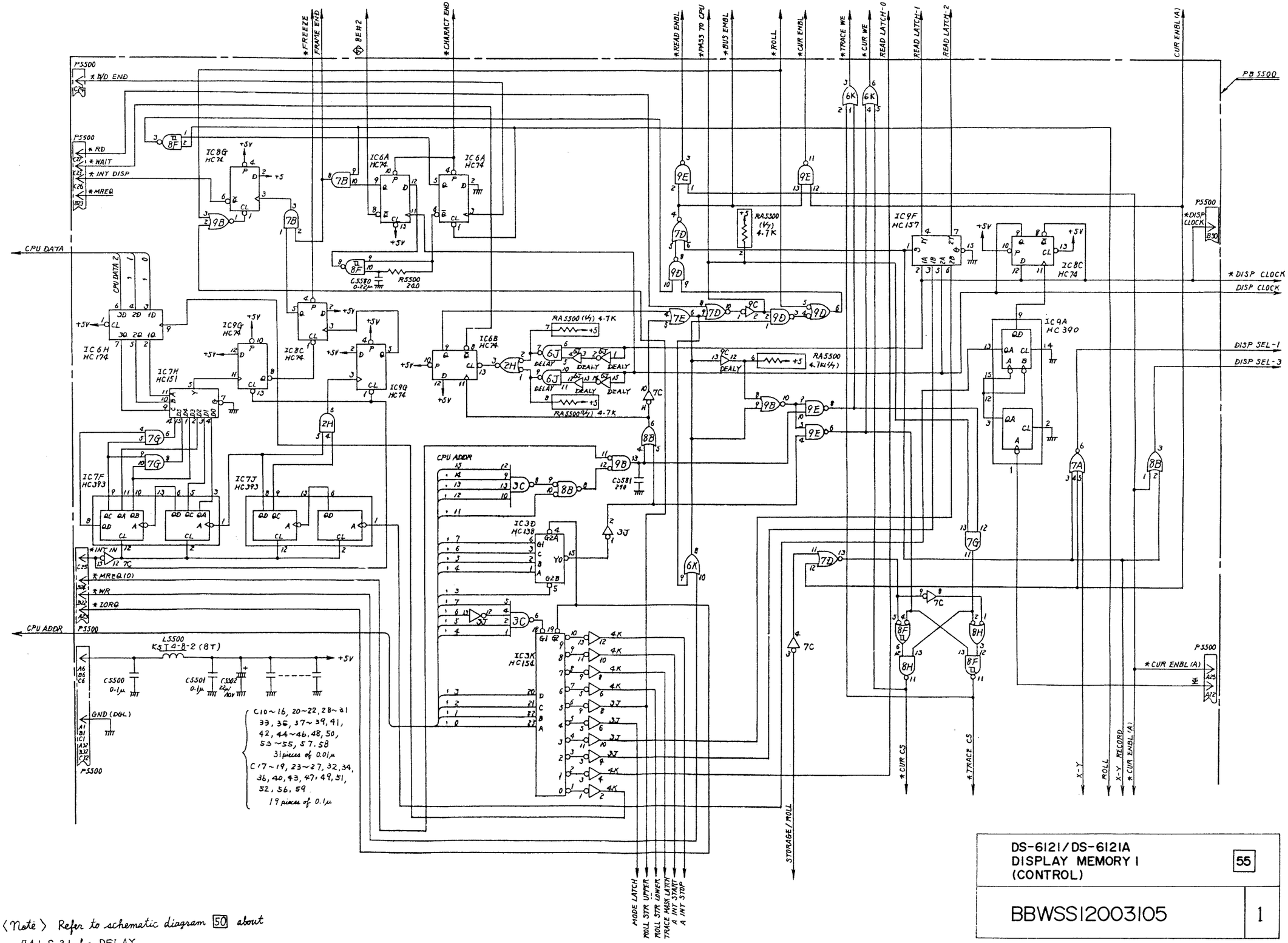
*RESET

DS-6121/DS-6121A
CPU CIRCUIT III
(SS INTERFACE & MEMORY)

54

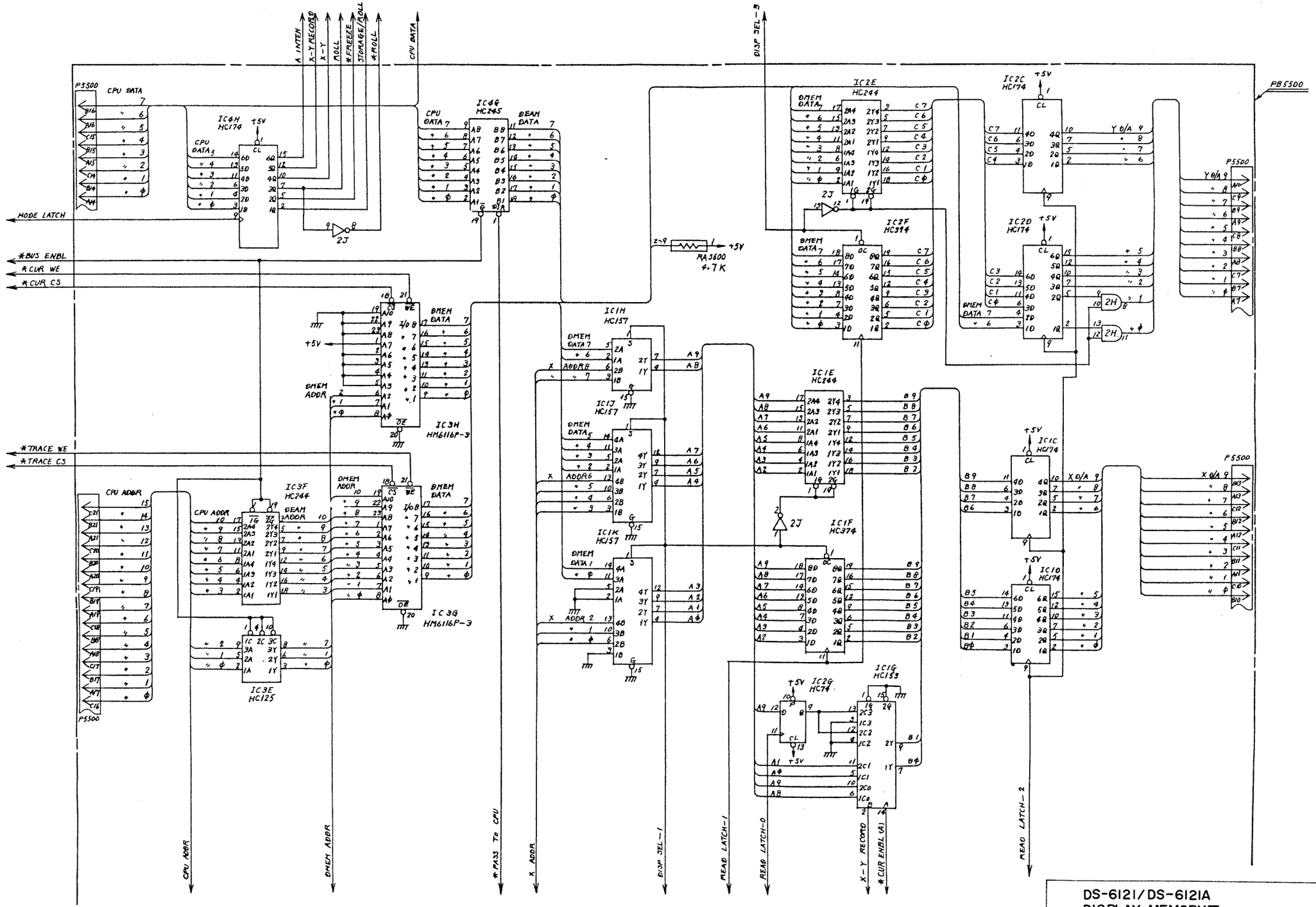
BBWSS10014107

1

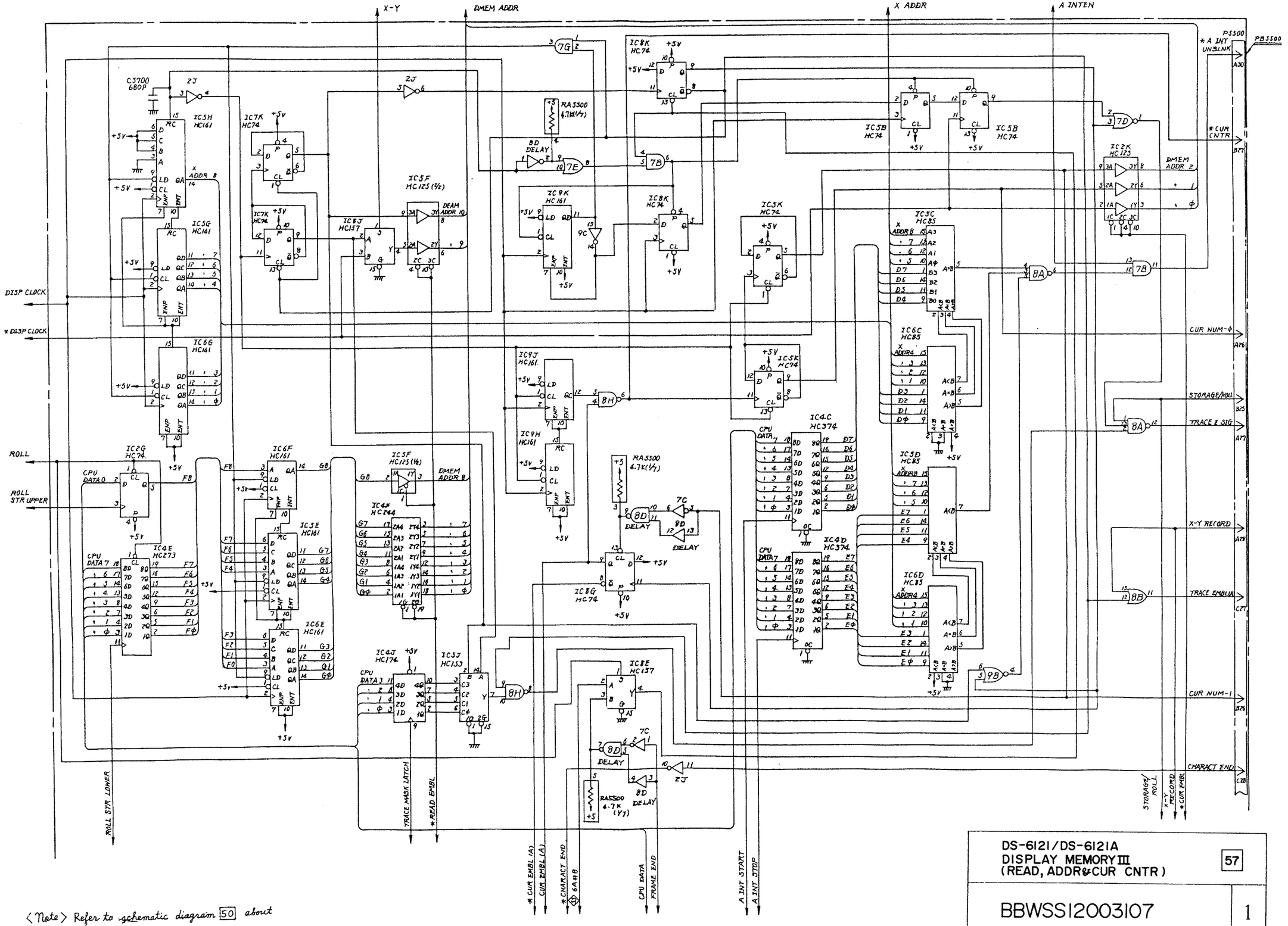


(Note) Refer to schematic diagram 50 about 74LS31 for DELAY

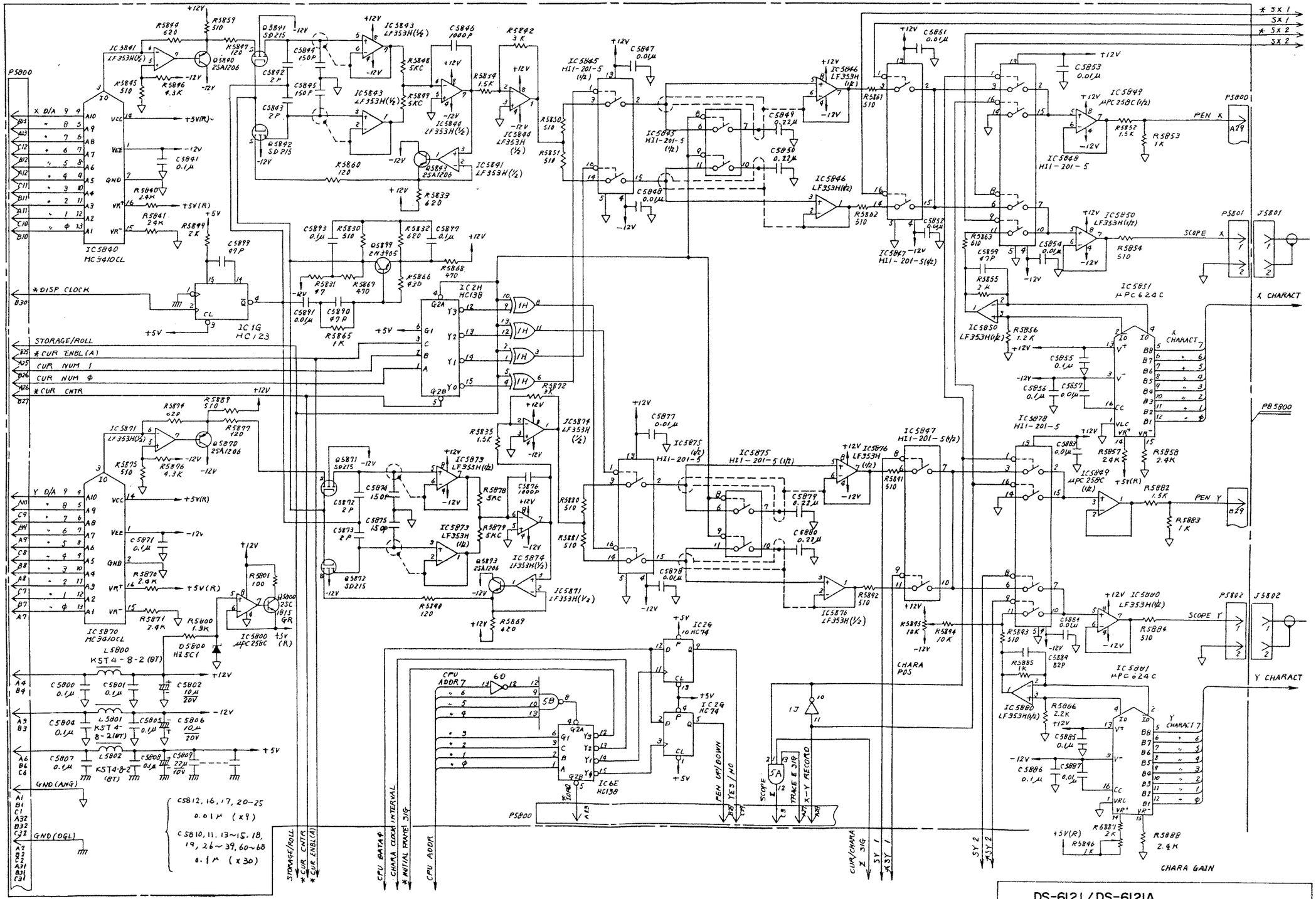
DS-6121/DS-6121A DISPLAY MEMORY I (CONTROL)	55
BBWSS12003105	1



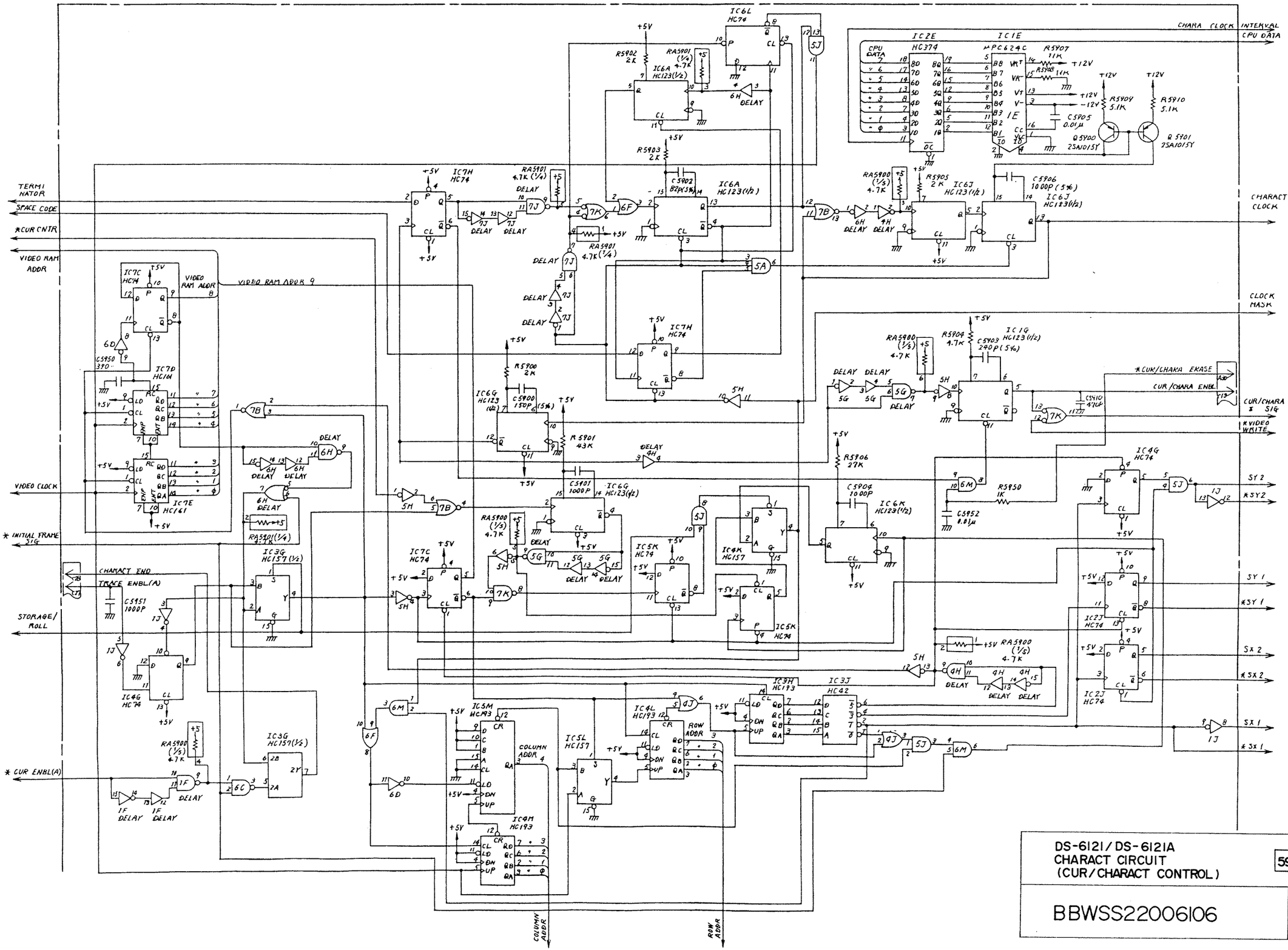
DS-6121/DS-6121A DISPLAY MEMORY II (DISP&CURSOR MEM)	56
BBWSS12003106	1



<Note> Refer to schematic diagram 50 about IC 74LS31 for DELAY



DS-6121/DS-6121A CHARACTER CIRCUIT (OUTPUT CIRCUIT)	58
BBWSS22006105	1

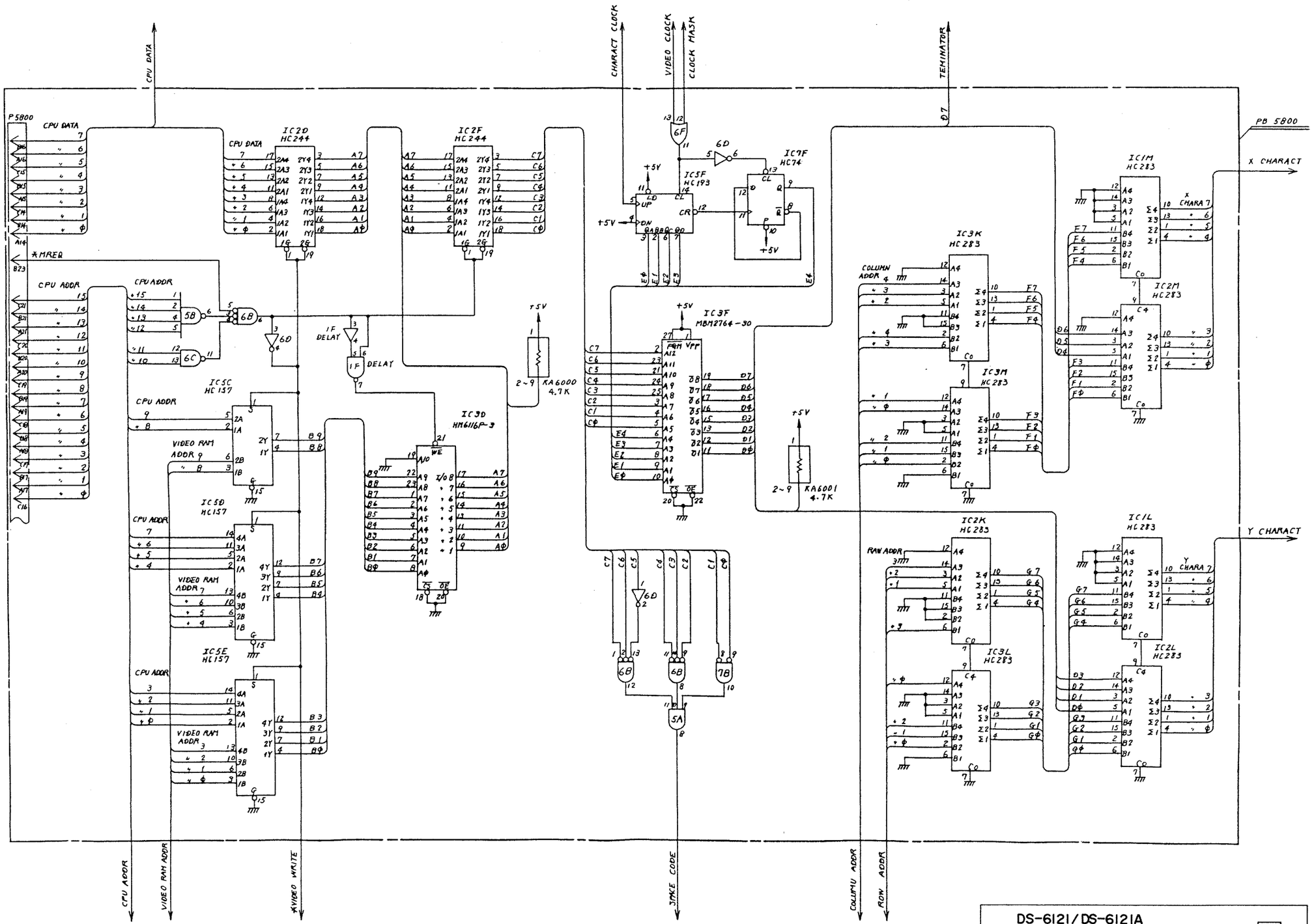


DS-6121/DS-6121A
CHARACT CIRCUIT
(CUR/CHARACT CONTROL)

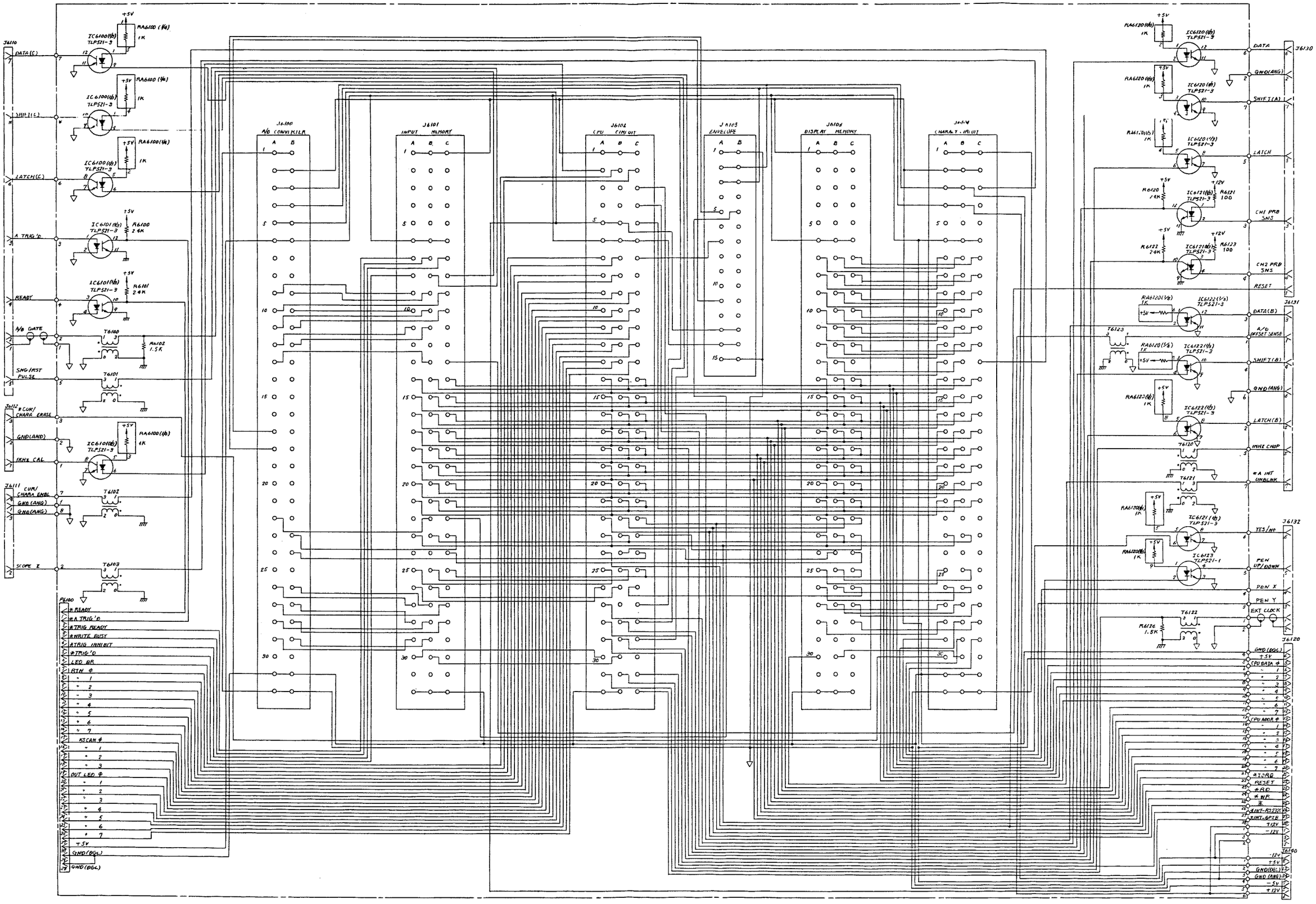
59

BBWSS22006106

1



DS-6121/DS-6121A CHARACTER CIRCUIT (CUR/CHARACT MAIN)	60
BBWSS22006107	1



<Note> Unless specified, ⏚ means GND(DGL)

DS-6121/DS-6121A
MOTHER BOARD 61

BBWSS02012105 1

CURSOR ◀ 1 S6270 | CURSOR ▶ 1 S6271 | CURSOR ◀ 2 S6272 | CURSOR ▶ 2 S6273 | POSITION ◀ HORIZ S6274 | FINE ◀ S6275 | FINE ▶ S6276 | X 10 MAG S6277

GUIDE MENU S6260 | QUIT LOCAL S6261 | LEVEL ▼ S6262 | LEVEL ▲ S6263 | POSITION ▶ HORIZ S6264 | TIME/DIV ◀ S6266 | TIME/DIV ▶ S6267

1 S6250 | 2 S6251 | SLOPE S6254 | ◀ A VARIABLE S6255 | ▶ A VARIABLE S6256 | FREEZE S6257

3 S6240 | 4 S6241 | HOLD OFF ◀ S6242 | COUPLING S6243 | DELAY ◀ TIME S6245 | DELAY ▶ TIME S6246 | STORAGE S6247

5 S6230 | 6 S6231 | SOURCE S6232 | ▼ TRACE SEPARATION S6235 | ▲ TRACE SEPARATION S6236 | SINGLE RESET S6237

7 S6220 | 8 S6221 | POSITION ▲ CH1 S6222 | HOLD OFF ▶ S6223 | DATA POSITION S6224 | POSITION ▲ CH2 S6225 | HORIZ DISPLAY S6226 | SWEEP MODE S6227

9 S6210 | 0 S6211 | POSITION ▼ CH1 S6212 | VOLTS/DIV ▲ CH1 S6213 | V COUPL CH2 S6214 | POSITION ▼ CH2 S6215 | VOLTS/DIV ▲ CH2 S6216 | BAND WIDTH S6217

2nd FUNC S6201 | V COUPL CH1 S6202 | VOLTS/DIV ▼ CH1 S6203 | CH2 POLAR S6205 | VOLTS/DIV ▼ CH2 S6206 | MODE S6207

RTN 7 | RTN 6 | RTN 5 | RTN 4 | RTN 3 | RTN 2 | RTN 1 | RTN 0

J6200

IC6200 HC138 — G2B, G2A, A, B, C, G1, Y0–Y7

IC6201 MC138 — KSCAN 0, KSCAN 1, KSCAN 2

IC6202 MC164 — KSCAN 3, CLRDBR

RA6200 2S-1.2KΩJ — 1.2K ×2

RA6201 3S-1.2KΩJ — 1.2K ×3

R6200 1K

R6201 6.2K

Q6210 2SC1815GR

RA6202 510 / 910 — Q6209 2SA952L/K, Q6208 2SA952L/K

RA6203 510 / 910 — Q6207 2SA952L/K, Q6206 2SA952L/K, Q6205 2SA952L/K

Q6204 2SA952L/K, Q6203 2SA952L/K, Q6202 2SA952L/K, Q6201 2SA952L/K, Q6200 2SA952L/K

+5V

RA6205 2S-100ΩJ — EE5 EE4 E5 E4

RA6206 4S-100ΩJ — EE3 EE2 EE1 EE0 E3 E2 E1 E0

D6279 ADD | D6278 REF | D6277 ALT | D6276 CHOP | D6275 CH1 (MODE) | D6274 CH2 (MODE)

D6273 AC (CH1) | D6272 GND (CH1) | D6271 DC (CH1) | D6270 AC (CH2) | D6269 GND (CH2) | D6268 DC (CH2)

RA6207 8-100ΩJ

RA6211 2ΩJ | RA6210 2ΩJ

D6267 X10 | D6266 REMOTE | D6265 ON (FREEZE) | D6264 UNCAL (A VARIABLE) | D6263 ZOOM | D6262 UNCAL (CH2) | D6261 INV | D6260 UNCAL (CH1)

D6259 X-Y | D6258 B DLY'D | D6257 A INTEN | D6256 A (HORIZ DISP) | D6255 SINGLE | D6254 NORM (SWEEP MODE) | D6253 AUTO

RA6208 7-100ΩJ

RA6209 1HR-8-750JĀ

RA6210 1HR-7-750JĀ

D6249 REFZ | D6248 X | D6247 Y | D6246 | D6245 | D6244 | D6243 | D6242 | D6241 | D6240 | D6239 | D6238

D6252 ON (2nd FUNC) | D6251 CH1 (CH1) | D6250 CH2 (CH2) | REF 1 | VOLTS/DIV (CH2) | VOLTS/DIV (CH1) | VARIABLE (CH2) | VARIABLE (CH1)

IC6209 F244

D6237 A (SOURCE) | D6236 B (SOURCE) | D6235 A (COUPLING) | D6234 B (COUPLING) | D6233 A SLOPE | D6232 A LEVEL | D6231 B SLOPE | D6230 B (LEVEL) | D6229 A (TIME/DIV) | D6228 B (TIME/DIV)

RA6211 1HR-5-750JĀ | RA6212 1HR-5-750JĀ

D6227 – (A SLOPE) | D6226 + (A SLOPE) | D6225 TV-V | D6224 LFREJ | D6223 HF REJ (A COUPLING) | D6222 DC (B COUPLING) | D6221 AC (B COUPLING) | D6220 EXT (B SOURCE)

D6219 CH2 (B SOURCE) | D6218 CH1 (B SOURCE) | D6217 RUN AFT DLY | D6216 LINE | D6215 NORM (A SOURCE) | D6214 EXT (A SOURCE) | D6213 CH2 (A SOURCE) | D6212 CH1 (A SOURCE)

D6211 – (B SLOPE) | D6210 + (B SLOPE) | D6209 TV-H | D6208 HF REJ (B COUPLING) | D6207 DC (B COUPLING) | D6206 AC (B COUPLING)

D6205 ON (STORAGE) | D6204 OFF (REAL) | D6203 PRE | D6202 CENT | D6201 POST | D6200 FULL POST

RA6213 6S-100ΩJ — BB7 BB6 BB5 BB4 B7 B6 B5 B4

RA6214 6S-100ΩJ — BB3 BB2 BB1 BB0 B3 B2 B1 B0

RA6215 2S-100ΩJ — AA5 AA4 A5 A4

RA6216 6S-100ΩJ — AA3 AA2 AA1 AA0 A3 A2 A1 A0

IC6204 F174 — G4 — OUT LED 0–7

IC6205 L3374 — G3 — OUT LED 0–7

IC6206 L3374 — G2 — OUT LED 0–7

IC6207 L3374 — G1 — OUT LED 0–7

IC6208 F174 — G0 — OUT LED 0–7

CA6200 1000P

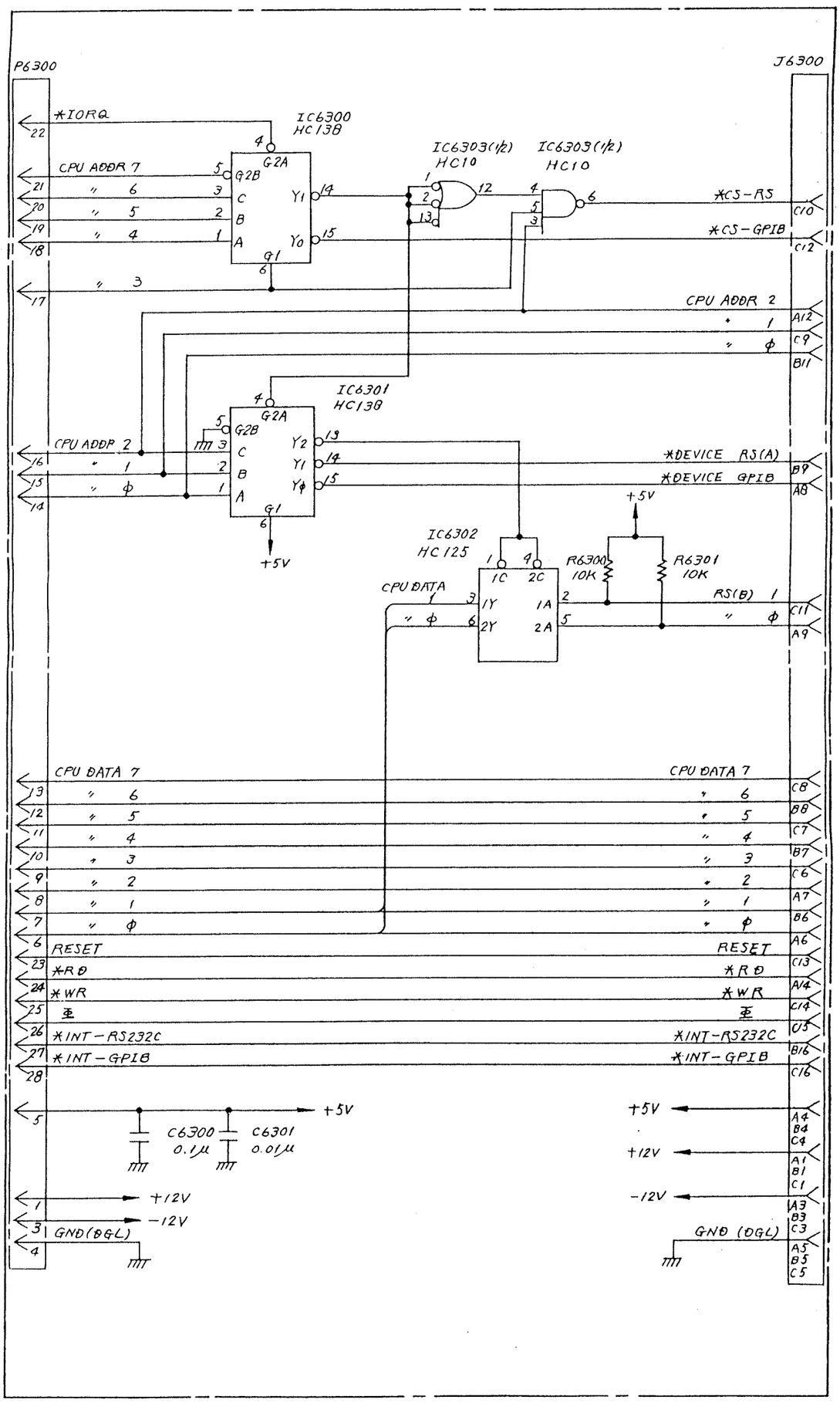
J6200

IC6703 7 of 17 — WRITE BUSY, TRIG READY, TRIG INHIBIT, TRIG'D, READY, ATRIG'D

6-120ΩJ RA6204

C6250–55 (0.01μF ×6) | C6200–05 (0.01μF ×6)

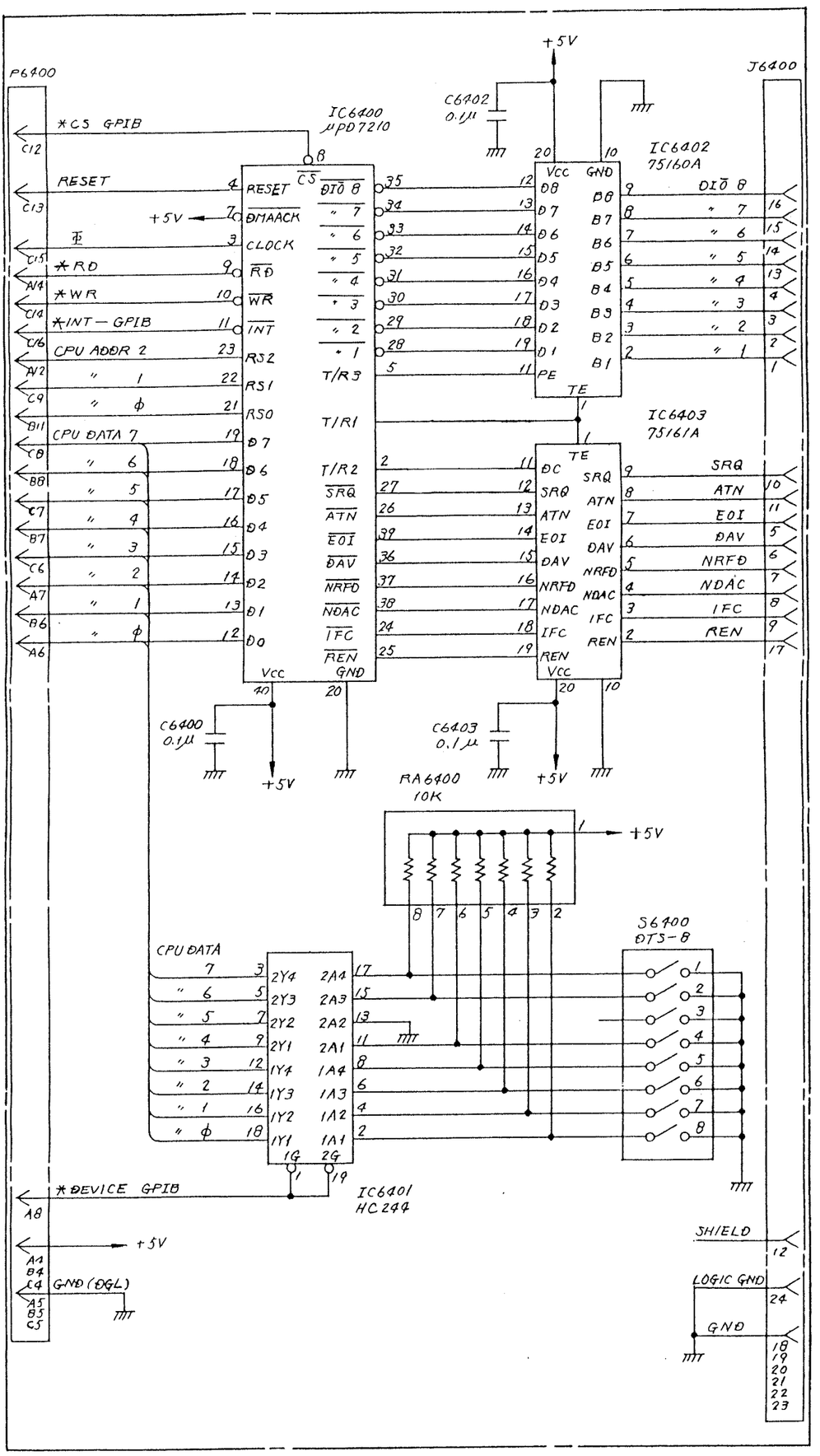
DS-6121/DS-6121A KEY BOARD	62
BBWSS40007105	1



DS-6121/DS-6121A
INTERFACE MOTHER
63

BBWSS02013105

1



DM-502
GP-IB
(OPTION)

64

BBWSSI3007105

1

DM-503
RS-232C
(OPTION)

65

BBWSSI3008105

1

5207-08 (J6605)

5207-08 8 (J6604)

(J6605) 5, 6

7, 8

(J6604) 7

2, 3

5566-2A P6602 J6602 5557-2R

5566-2A P6601

T6601 FS37824

T6602 FS37825

T6603 FS37800

CR6601 BCR6AM-12

DS6601 S4VB60

PC6601 TLP521-1

IC6601 MB3759

Q6601 2SC3262

Q6602 2SC3148

Q6603 2SC3179

Q6604 2SK30AGR

Q6605 2SA 1020

Q6606 2SA 1015

Q6607 2SC 1815

L6601 FS38191

L6602 FS38191

L6603 FS38191

L6604

L6605

C6601 222M

C6602 222M

C6603 XE104

C6604 XE104

C6605 XE104

C6606 XE104

C6607 222M

C6608 TSU 400V 220μF

C6609 TSU 400V 220μF

C6610 MMH 400V 104

C6611 2KV 471

C6612 MF-3S333K

C6613 MMH 250V 473

C6614 MF-3S103

C6615 25SSP 220

C6616 MF-3S104K

C6617 3KΩ

C6618 MF-3S 473K

C6619 25SSP 47

C6620 MF-3S222K

C6621 MF-3S472K

C6622 2K 22J

C6623 2KV 221

C6624 ZKY10Z

C6625 ZKY10Z

C6626 160TWSH 10

C6627 63PS1 220

C6628 25SSP 1000

C6629 25SSP 1000

C6630 25SSP 1000

C6631 25SSP 1000

C6634 SXE 10V 3300

C6635 SXE10V 8200

C6636 SXE 10V 8200

C6637 AMZV 224K

C6638 MF-3S103K

R6601 22KΩ 2W

R6602 A53K 10ΩJ

R6603 1KΩ

R6604 22Ω Y2W

R6605 R6605 22KΩ 2W

R6607 3.3Ω 1W

R6608 470Ω 2W

R6609 47KΩ 1W

R6610 470KΩ

R6611 120Ω

R6612 RF25S 3.3Ω

R6613 KA1C

R6614 RG1C

R6615 33ΩΩ

R6616 91Ω

R6617 3KΩ

R6618 3.3KΩ

R6619 33KΩ

R6620 EF1/4 30Ω

R6621 EF1/4 100Ω

R6622 15KΩ

R6623 3.3KΩ

R6624 5.6KΩ

R6625 2.2KΩ

R6626 11KΩ

R6627 1KΩ

R6628 16KΩ

R6629 10KΩ

R6630 15KΩ

R6631 47Ω 2W

R6632 220Ω 2W

R6633 10Ω

R6634 220Ω 2W

R6635 10Ω

R6636 MPC 0.05Ω

R6643 FE1/4 175Ω

R6686 100K

RF25S 10Ω

D6601 EM1

D6602 1S953

D6603 RG1C

D6604 RG1C

D6605 RD3.0 ESB

D6606 EU2

D6607 1S953

D6608 RD8.2ESB

D6609 EU2

D6610 EU2

D6611 1S953

D6613 KA1C

D6614 RG1C

DS6603 10DL2C41

DS6604 10DL2C41

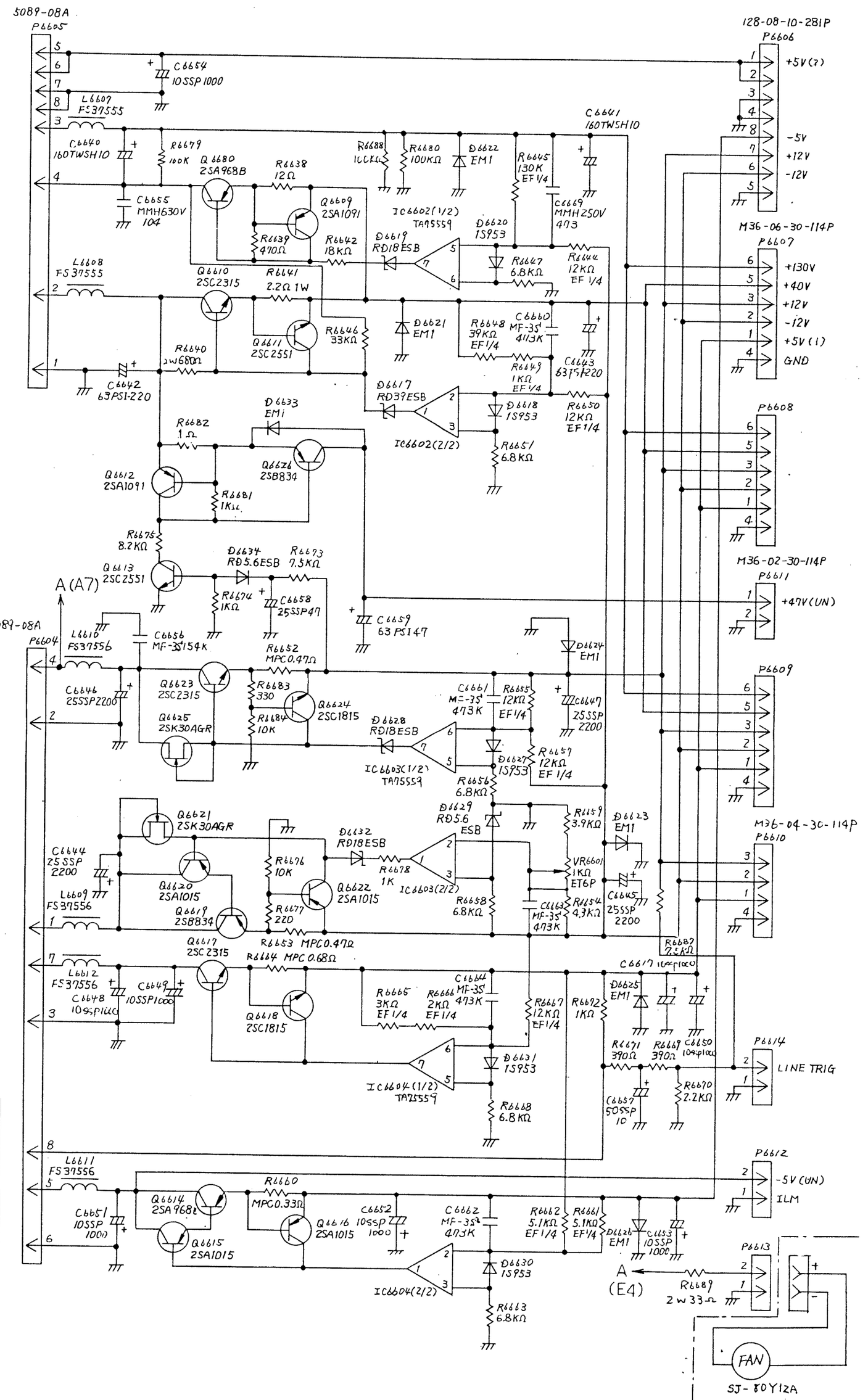
DS6605 D10SC6M

DS6602 10DL2C41

D 1S953

D6616 S1S4M

DS-6121/ DS-6121A POWER SUPPLY	66
BBWDS08005101	1



DS-6121/DS-6121A
POWER SUPPLY

66

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BBWDS08005102

Section 6 Electrical Parts List

Ordering Information

Replacement parts may be ordered through an IWATSU representative of directly from the factory. To be certain of receiving the proper parts, a ways include the following information with the order:

a. Model Number and serial number of the instrument on which the parts will be installed.
b. Circuit reference number and subassembly name, if applicable for which the part is intended. If the part does not have a circuit reference, the description from the parts list should be used.
c. Iwatsu part number.

For factory repair, contact the IWATSU agent and include the following information:

a. Model number and serial number of the instrument on which the work is to be performed.
b. Details concerning the nature of the malfunction, or, type of repair desired.

Shipping instructions will be sent to you promptly.

Component locations can be determined from the schematic diagrams, each component appears only once in the parts list. At the beginning of each subsection are listed part number for any complete subassemblies in that category that are available replacement parts. These subassemblies may include individually-listed components; care should be taken to pinpoint malfunctions to the exact replacement parts actually needed and thus avoid the time and cost involved in "over-repair".

Abbreviations

Cap . . . . . .Capacitor
Cer. . . . . .Ceramic
Poly . . . . . .Polyethytel film
Elect. . . . . .Aluminum electrolytic chemical
Elect. tan. . . . . .Tan-talum electrolytic chemical condenser
[The symbol F (farad) is omitted]
Res. . . . . .Resistor
W.W . . . . . .Wire wound
Comp . . . . . .Composition
[The symbol Ω (ohm) is omitted]
FET . . . . . .Field Effect Transistor
Diode . . . . . .
T. diode. . . . . .Tunnel diode
Z. diode. . . . . .Zenner diode
S.B. diode . . . . . .Schottky barrier diode
V.C. diode . . . . . .Variable capacitance diode
L.E.D.. . . . . .Light emission diode
IC. . . . . .Integrated Circuit
Var. . . . . .Variable

CH-1 ATT 01

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C0100	Cap., 15P, ±10%, 500V, Cer.	DCC252001
C0101	Cap., 0.047μ, ±20%, 20V, Film	DCF160291
C0102	Cap., 3P, ±0.25pF, 50V, Cer.	DCC815061
C0103	Cap., 1.3~3.0p, Var., 250V, Cer., MAT	DCV019672
C0104	Cap., 1.5~5.5p, Var., 250V, Cer., MAT	DCV019722
C0105	Cap., 5p, ±0.25pF, 50V, Cer.	DCC815101
C0106	Cap., 68p, ±5%, 50V, Cer.	DCC815251
C0107	Same as C02	
C0108	Same as C03	
C0109	Same as C04	
C0110	Cap., 6p, ±0.5pF, 50V, Cer.	DCC815111
C0111	Cap., 33p, ±5%, 50V, Cer.	DCC815211
C0112	Cap., 1p, ±0.25pF, 50V, Cer.	DCC250301
C0113	Cap., 1000p, ±10%, 500V, Cer.	DCC151811
C0114	Cap., 0.01μ, ±10%, 50V, Cer.	DCC810171
C0115	Same as C14	
C0116	Cap., 22μ, +150%~−10%, 25V, Elect.	DCE225151
C0117	Cap., 270p, ±5%, 50V, Cer.	DCC815321
C0118	Same as C04	
C0119	Cap., 15p, ±5%, 50V, Cer.	DCC815171
C0120	Same as C02	
C0123	Same as C16	
C0124	Same as C16	
C0125	Cap., 2200p, ±10%, 50V, Film	DCF120151
C0126	Same as C14	
C0127	Same as C14	
C0128	Cap., 2.5p, ±0.25pF, 50V, Cer.	DCC815051
C0129	Cap., 1.5p, ±0.25pF, 50V, Cer.	DCC815031
C0131	Same as C14	
C0132	Same as C14	
C0133	Same as C14	
C0134	Same as C14	
C0135	Same as C14	
C0136	Same as C14	
C0137	Same as C14	
C0138	Same as C14	
C0139	Same as C14	
C0140	Same as C14	
C0141	Same as C14	
C0142	Same as C14	
C0143	Same as C14	
C0144	Same as C14	
C0145	Same as C14	
C0146	Same as C14	
C0147	Same as C14	
C0151	Cap., 0.033μ, ±10%, 50V, Film	DCF120291
C0152	Cap., 100μ, +150%~−10%, 25V, Elect.	DCE225181
C0153	Same as C14	
C0154	Same as C16	
C0155	Same as C52	
C0160	Same as C05	
C0161	Cap., 7p, ±0.5pF, 50V, Cer.	DCC815121
C0162	Same as C28	
R0100	Res., 39, ±1%, 1/4W, Metal	DRE130491
R0101	Res., 22, ±5%, 1/8W, Carbon	DRZ840191
R0102	Res., 470, ±5%, 1/8W, Carbon	DRZ840511
R0103	Res., 56, ±5%, 1/8W, Carbon	DRZ840291
R0104	Same as R01	
R0105	Res., 900K, ±0.25%, 1/4W, Metal	DRE930831
R0106	Res., 111K, ±0.25%, 1/4W, Metal	DRE930801
R0107	Res., 1K, ±20%, 0.5W, Cermet	DRV410531
R0108	Res., 110, ±5%, 1/8W, Carbon	DRZ840361
R0109	Res., 100, ±5%, 1/8W, Carbon	DRZ840351
R0110	Res., 22, ±1%, 1/5W, Metal	DRE999051
R0111	Same as R05	
R0112	Same as R06	
R0113	Same as R07	
R0114	Res., 100, ±5%, 1/8W, Carbon	DRZ840351
R0115	Res., 820K, ±0.25%, 1/4W, Metal	DRE930821
R0116	Res., 180K, ±0.25%, 1/4W, Metal	DRE930811
R0117	Res., 10M, ±5%, 1/2W, Metal	DRG940321
R0118	Res., 47, ±5%, 1/8W, Carbon	DRZ840271
R0119	Res., 300, ±5%, 1/5W, Metal	DRE999501
R0120	Res., 10K, ±5%, 1/8W, Carbon	DRZ840831
R0121	Res., 1.2K, ±1%, 1/5W, Metal	DRE999261
R0122	Res., 200, ±1%, 1/5W, Metal	DRE999531
R0123	Res., 330, ±5%, 1/8W, Carbon	DRZ840471

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
R0124	Res., 2.4K, ±1%, 1/5W, Metal	DRE999791
R0125	Res., 20K, ±20%, 0.5W, Cermet	DRV410571
R0126	Same as R16	
R0127	Same as R15	
R0128	Res., 1.0K, ±1%, 1/5W, Metal	DRE999251
R0129	Res., 33, ±5%, 1/8W, Carbon	DRZ840231
R0130	Res., 560, ±5%, 1/8W, Carbon	DRZ840531
R0131	Res., 120, ±0.25%, 1/4W, Metal	DRE231551
R0132	Same as R31	
R0133	Res., 300, ±0.25%, 1/4W, Metal	DRE231731
R0134	Res., 75, ±0.25%, 1/4W, Metal	DRE231721
R0135	Res., 60, ±0.25%, 1/4W, Metal	DRE231081
R0136	Res., 100K, ±1%, 1/5W, Metal	DRE999491
R0137	Res., 3.6K, ±5%, 1/8W, Carbon	DRZ840721
R0138	Same as R18	
R0140	Same as R03	
R0141	Res., 100, ±5%, 1/8W, Carbon	DRZ840351
R0151	Res., 39, ±1%, 1/5W, Metal	DRE999081
D0101	Diode, 1S1544A, NEC	DDD010341
D0102	Same as D01	
D0103	Same as D01	
D0104	Diode, 1SS226, TOS	DDD810081
D0105	Same as D04	
Q0101	Transistor, 2SK141L2A, NEC	DTR215321
Q0102	Transistor, 2SC3120, TOS	DTR830111
Q0103	Transistor, 2SC3098, TOS	DTR830101
Q0104	Transistor, 2SA1162, TOS	DTR810031
IC0101	IC, MC74HC595N, MOT	DIC445961
IC0102	Same as IC01	
IC0103	IC, μPA2004C, NEC	DTR190751
IC0104	Same as IC03	
IC0105	IC, OF355H-S4, NS	DIC613661
RL0101	Lead relay, URS-123S, NEC	DKD065451
RL0102	Same as RL01	
RL0103	Same as RL01	
RL0104	Same as RL01	
RL0105	Same as RL01	
RL0106	Same as RL01	
RL0107	Same as RL01	
RL0108	Same as RL01	
RL0109	Lead relay, RRF-51A12D	DKD065261
RL0110	Same as RL09	
RL0111	Same as RL09	
J0101	Connector, BNC080,STU	DCN040711

CH-2 ATT 02

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C0200	Cap., 15p, ±10%, 500V, Cer	DCC252001
C0201	Cap., 0.047μ, ±20%, 20V, Film	DCF160291
C0202	Cap., 3p, ±0.25pF, 50V, Cer	DCC815061
C0203	Cap., 1.3~3.0p, Var, 250V, Cer	DCV019672
C0204	Cap., 1.5~5.5p, Var, 250V, Cer	DCV019722
C0205	Cap., 5p, ±0.25pF, 50V, Cer	DCC815101
C0206	Cap., 68p, ±5%, 50V, Cer	DCC815251
C0207	Same as C02	
C0208	Same as C03	
C0209	Same as C04	
C0210	Cap., 6p, ±0.5pF, 50V, Cer	DCC815111
C0211	Cap., 33p, ±5%, 50V, Cer	DCC815211
C0212	Cap., 0.5~1.5p, Var., 500V, Cer	DCV023131
C0213	Cap., 1000p, ±10%, 500V, Cer	DCC151811
C0214	Cap., 0.01μ,±10%, 50V, Cer	DCC810171
C0215	Same as C14	
C0216	Cap, 22μ,+150%~-10%, 25V, Elect	DCE225151
C0217	Cap., 270p, ±5%, 50V, Cer	DCC815321
C0218	Same as C04	
C0219	Cap., 15p, ±5%, 50V, Cer	DCC815171
C0220	Same as C02	
C0223	Same as C16	
C0224	Same as C16	
C0225	Cap., 2200p, ±10%, 50V, Film	DCF120151
C0226	Same as C14	
C0227	Same as C14	
C0228	Cap., 2.5p, ±0.25pF, 50V, Cer	DCC815051
C0229	Cap., 1.5p, ±0.25pF, 50V, Cer	DCC815031
C0231	Same as C14	
C0232	Same as C14	
C0233	Same as C14	
C0234	Same as C14	
C0235	Same as C14	
C0236	Same as C14	
C0237	Same as C14	
C0238	Same as C14	
C0239	Same as C14	
C0240	Same as C14	
C0241	Same as C14	
C0242	Same as C14	
C0243	Same as C14	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C0244	Same as C14	
C0245	Same as C14	
C0246	Same as C14	
C0247	Same as C14	
C0251	Cap., 0.033μ, ±10% 50V, Film	DCF120291
C0252	Cap., 100μ, +150%~-10%, 25V, Elect	DCE225181
C0253	Same as C14	
C0254	Same as C16	
C0255	Same as C52	
C0260	Same as C05	
C0261	Cap., 7p, ±0.5pF, 50V, Cer	DCC815121
C0262	Same as C29	
R0200	Res., 39, ±1%, 1/4W, Metal	DRE130491
R0201	Res., 22, ±5%, 1/8W, Carbon	DRZ840191
R0202	Res., 470, ±5%, 1/8W, Carbon	DRZ840511
R0203	Res., 56, ±5%, 1/8W, Carbon	DRZ840291
R0204	Same as R01	
R0205	Res., 900K, ±0.25%, 1/4W, Metal	DRE930831
R0206	Res., 111K, ±0.25%, 1/4W Metal	DRE930801
R0207	Res., 1K, ±20%, 0.5W, Cermet	DRV410531
R0208	Res., 91, ±5%, 1/8W, Carbon	DRZ840341
R0209	Res., 100, ±5%, 1/8W, Carbon	DRZ840351
R0210	Res., 22, ±1%, 1/5W, Metal	DRE999051
R0211	Same as R05	
R0212	Same as R06	
R0213	Same as R07	
R0214	Res., 100, ±5%, 1/8W, Carbon	DRZ840351
R0215	Res., 180K, ±0.25%, 1/4W, Metal	DRE930821
R0216	Res., 180K, ±0.25%, 1/4W, Metal	DRE930811
R0217	Res., 47, ±5%, 1/2W, Metal	DRG940321
R0218	Res., 47, ±5%, 1/8W, Carbon	DRZ840271
R0219	Res., 300, ±1%, 1/5W, Metal	DRE999501
R0220	Res., 10K, ±5%, 1/8W, Carbon	DRZ840831
R0221	Res., 1.2K, ±1%, 1/5W, Metal	DRE999261
R0222	Res., 200, ±1%, 1/5W, Metal	DRE999531
R0223	Res., 330, ±5%, 1/8W, Carbon	DRZ840471
R0224	Res., 2.4K, ±1%, 1/5W, Metal	DRE999791
R0225	Res., 20K, ±20%, 0.5W, Cermet	DRV410571
R0226	Same as R16	
R0227	Same as R15	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
R0228	Res., 1.0K, ±1%, 1/5W, Metal	DRE999251
R0229	Res., 33, ±5%, 1/8W, Carbon	DRZ840231
R0230	Res., 560, ±5%, 1/8W, Carbon	DRZ840531
R0231	Res., 120, ±0.25%, 1/4W, Metal	DRE231551
R0232	Same as R31	
R0233	Res., 300, ±0.25%, 1/4W, Metal	DRE231731
R0234	Res., 75, ±0.25%, 1/4W, Metal	DRE231721
R0235	Res., 60, ±0.25%, 1/4W, Metal	DRE231081
R0236	Res., 100K, ±1%, 1/5W, Metal	DRE999491
R0237	Res., 3.6K, ±5%, 1/8W, Carbon	DRZ840721
R0238	Same as R18	
R0240	Same as R03	
R0241	Res., 100, ±5%, 1/8W, Carbon	DRZ840351
R0250	Res., 39, ±1%, 1/5W, Metal	DRE999081
D0201	Diode, 1S1544A, NEC	DDD010341
D0202	Same as D01	
D0203	Same as D01	
D0204	Diode, 1SS226, TOS	DDD810081
D0205	Same as D04	
Q0201	Transistor, 2SK141L2A, NEC	DTR215321
Q0202	Transistor, 2SC3120, TOS	DTR830111
Q0203	Transistor, 2SC3098, TOS	DTR830101
Q0204	Transistor, 2SA1162, TOS	DTR810031
IC0201	IC, MC74HC595N, MOT	DIC445961
IC0202	Same as IC01	
IC0203	IC, μPA2004C, NEC	DTR190751
IC0204	Same as IC03	
IC0205	IC, LF355H-s$, NS	DIC613661
RL0201	Lead relay, URS-123S	DKD065451
RL0202	Same as RL01	
RL0203	Same as RL01	
RL0204	Same as RL01	
RL0205	Same as RL01	
RL0206	Same as RL01	
RL0207	Same as RL01	
RL0208	Same as RL01	
RL0209	Lead relay, RRF-51A12D	DKD065261
RL0210	Same as RL09	
RL0211	Same as RL09	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
J0201	Connector, BNC080, STU	

CH-1 PRE AMP (1) 03

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C0301	Cap., 120p, ±5%, 50V, Cer	DCC815281
C0302	Cap., 2~8p, Var., 250V, Cer	DCV019612
C0303	Cap., 2~12p, Var., 250V, Cer	DCV810171
C0304	Cap., 0.01μ, ±10%, 50V, Cer	DCC810171
C0305	Same as C04	
C0306	Same as C04	
C0307	Cap., 680p, ±5%, 50V, Cer	DCC815371
C0308	Cap., 150p, ±5%, 50V, Cer	DCC815291
C0310	Cap., 33p, ±5%, 50V, Cer	DCC815211
C0311	Same as C03	
C0313	Cap., 1000p, ±10%, 50V, Cer	DCC810051
C0314	Same as C13	
C0315	Cap., 0.027μ, ±10%, 50V, Cer	DCC810221
C0316	Cap., 680p, ±5%, 50V, Cer	DCC815371
C0317	Cap., 3300p, ±10%, 50V, Film	DCF120171
C0318	Cap., 5~40p, Var, 250V, Cer	DCV019752
C0319	Cap., 100p, ±5%, 50V, Cer	DCC815271
C0321	Same as C13	
C0322	Same as C13	
C0323	Same as C04	
C0324	Cap., 0.01μ, ±10%, 50V, Cer	DCC810171
C0325	Same as C04	
C0329	Same as C04	
C0330	Same as C04	
C0332	Cap., 47p, ±5%, 50V, Cer	DCC815231
C0333	Same as C04	
C0334	Same as C04	
C0335	Same as C04	
C0340	Cap., 5p, ±0.25pF, 50V, Cer	DCC815101
C0341	Cap., 3p, ±0.25pF, 50V, Cer	DCC815061
C0350	Cap., 22p, ±0.25pF, 50V, Cer	DCC815191
C0360	Same as C24	
C0361	Cap., 82p, ±5%, 50V, Cer	DCC815261
R0301	Res., 33, ±5%, 1/8W, Carbon	DRZ840231
R0302	Res., 10K, ±1%, 1/5W, Metal	DRE999371
R0303	Same as R0302	
R0304	Res., 100, ±1%, 1/5W, Metal	DRE99131
R0305	Same as R0302	
R0306	Res., 10K, ±20%, 0.5W, Cermet	DRV410561
R0307	Res., 47, ±5%, 1/8W, Carbon	DRZ840271
R0308	Res., 1.8K, ±1%, 1/5W, Metal	DRE999281
R0309	Res., 120, ±1%, 1/5WI Metal	DRE999141
R0310	Same as R0308	R
R0311	Same as R0307	
R0312	Res., 2.2K, ±1%, 1/5W, Metal	DRE999291
R0313	Same as R0304	
R0314	Res., 68, ±5%, 1/8W, Carbon	DRZ840311
R0315	Res., 200, Var, 0.3W, Cermet	DRV412011
R0316	Same as R0314	
R0317	Same as R0314	
R0318	Res., 2.7K, ±1%, 1/5W, Metal	DRE999301
R0319	Same as R0318	
R0320	Res., 47K, ±5%, 1/8W, Carbon	DRZ840991
R0321	Same as R0314	
R0322	Res., 680, ±1%, 1/5W, Metal	DRE999231
R0324	Same as R0312	
R0325	Same as R0312	
R0326	Same as R0322	
R0328	Res., 6.8K, ±5%, 1/8W, Carbon	DRZ840791
R0329	Res., 2.2K, ±5%, 1/8W, Carbon	DRZ840671
R0330	Res., 220, ±1%, 1/5W, Metal	DRE999171
R0331	Same as R0330	
R0333	Res., 0Ω	DRZ841601
R0334	Same as R0333	
R0335	Same as R0329	
R0336	Same as R0329	
R0337	Same as R0333	
R0338	Same as R0333	
R0339	Res., 560, ±1%, 1/5W, Metal	DRE999221
R0340	Same as R0339	
R0341	Res., 50K, Var, 0.3W, Cermet	DRV412061
R0342	Same as R0341	
R0344	Res., 180, ±1%, 1/5W, Metal	DRE999161
R0345	Res., 20K, Var, 0.3W, Cermet	DRV412161
R0346	Res., 1K, Var, 0.3W, Cermet	DRV412031
R0347	Res., 100, ±5%, 1/8W, Carbon	DRZ840351
R0348	Same as R0347	
R0349	Res., 220, ±5%, 1/8W, Carbon	DRZ840431
R0350	Same as R0349	
R0351	Same as R0344	
R0352	Res., 100, ±5%, Thermistor	DDD080331
R0353	Res., 100, ±20%, 0.5W, Cermet	DRV410501
R0354	Same as R0346	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
R0355	Res., 5K, Var, 0.3W, Cermet	DRV412051
R0356	Res., 3.3K, ±5%, 1/4W, Carbon	DRD134951
R0357	Same as R0355	
R0359	Res., 620, ±1%, 1/5W, Metal	DRE999761
R0360	Same as R0359	
R0361	Res., 390, ±5%, 1/8W, Carbon	DRZ840491
R0362	Same as R0361	
R0363	Same as R0308	
R0364	Same as R0308	
R0365	Res., 10K, Var, 0.3W, Cermet	DRV411991
R0366	Same as R0365	
R0367	Res., 6.8K, ±1%, 1/5W, Metal	DRE999351
R0368	Res., 1.0K, ±1%, 1/5W, Metal	DRE999251
R0369	Res., 15K, ±5%, 1/8W, Carbon	DRZ840871
R0370	Res., 22K, ±5%, 1/8W, Carbon	DRZ840911
R0371	Same as R0320	
R0372	Same as R0320	
R0373	Same as R0370	
R0374	Res., 7.5K, ±0.5%, 1/5W, Metal	DRE998401
R0375	Same as R0302	
R0376	Same as R0374	
R0377	Res., 5K, ±20%, 0.5W, Cermet	DRV410551
R0378	Same as R0302	
R0379	Same as R0302	
R0380	Same as R0302	
R0381	Same as R0302	
R0382	Res., 100K, ±20%, 0.5W, Cermet	DRV410591
R0383	Res., 330K, ±1%, 1/5W, Metal	DRE998121
R0384	Same as R0369	
R0385	Same as R0270	
R0386	Same as R0369	
R0387	Same as R0370	
R0388	Same as R0320	
R0389	Same as R0320	
R0390	Same as R0370	
R0391	Res., 27K, ±1%, 1/5W, Metal	DRE999421
R0392	Res., 56K, ±1%, 1/5W, Metal	DRE999461
R0393	Same as R0392	
R0394	Res., 470, ±5%, 1/8W, Carbon	DRZ840511
R0395	Res., 1K, ±5%, Thermistor	DDD080421
R0396	Res., 2.4K, ±1%, 1/5W, Metal	DRE999791
R0397	Same as R0391	
R0398	Same as R0307	
R0399	Same as R0307	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
D0301	Z. Diode, RD 5.6 EB	DDD032941
Q0301	Transistor, 2SC3098, TOS	DTR830101
Q0302	Same as Q0301	
Q0303	Same as Q0301	
Q0304	Same as Q0301	
Q0305	Transistor, 2SA1206, NEC	DTR115301
Q0306	Same as Q0305	
Q0307	Transistor, 2SC1621, NEC	DTR838021
Q0308	Same as Q0307	
Q0309	Same as Q0301	
Q0310	Same as Q0301	
Q0311	Transistor, 2SC1907, NEC	DTR137611
Q0312	Same as Q0311	
Q0313	Transistor, 3SK129, MAT	DTR230171
Q0314	Transistor, 2SA1162, TOS	DTR810031
Q0315	Transistor, 2SC2712, TOS	DTR830041
Q0316	Same as Q0314	
Q0317	Same as Q0314	
Q0318	Same as Q0315	
Q0319	Same as Q0314	
IC0301	IC, μPC 251C, NEC	DIC610091
IC0303	IC, μPC 624C, NEC	DIC641761
IC0304	IC, MC 74HC595N, MOT	IDC445961
RL0321	Relay, SY-12	DKD027301

CH-2 PRE AMP (I) 04

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C0401	Cap., 120p, ±5%, 50V, Cer	DCC815281
C0402	Cap., 2~8p, Var., 250V, Cer	DCV019612
C0403	Cap., 2~12p, Var., 250V, Cer	DCV019602
C0404	Cap., 0.01μ, ±10%, 50V, Cer	DCC810171
C0405	Same as C04	
C0406	Same as C04	
C0407	Cap., 680p, ±5%, 50V, Cer	DCC815371
C0408	Cap., 150p, ±5%, 50V, Cer	DCC815291
C0410	Cap., 33p, ±5%, 50V, Cer	DCC815211
C0411	Same as C0403	
C0413	Cap., 1000p, ±10%, 50V, Cer	DCC810051
C0414	Same as C0413	
C0415	Cap., 0.027μ, ±10%, 50V, Cer	DCC810221
C0416	Cap., 680p, ±5%, 50V, Cer	DCC815371
C0417	Cap., 3300p, ±10%, 50V, Film	DCF120171
C0418	Cap., 5~40p, Var, 250V, Cer	DCV019752
C0419	Cap., 100p, ±5%, 50V, Cer	DCC815271
C0421	Same as C0413	
C0422	Same as C0413	
C0423	Same as C0404	
C0424	Cap., 0.01μ, ±10%, 50V, Cer	DCC810171
C0425	Same as C0404	
C0429	Same as C0404	
C0430	Same as C0404	
C0432	Cap., 47p, ±5%, 50V, Cer	DCC815231
C0433	Same as C0404	
C0434	Same as C0404	
C0435	Same as C0404	
C0440	Cap., 5p, ±0.25pF, 50V, Cer	DCC815101
C0441	Cap., 3p, ±0.25pF, 50V, Cer	DCC815061
C0460	Same as C0424	
C0461	Cap., 15p, ±5%, 50V, Cer	DCC815171
R0401	Res., 33, ±5%, 1/8W, Carbon	DRZ840231
R0402	Res., 10K, ±1%, 1/5W, Metal	DRE999371
R0403	Same as R0402	
R0404	Res., 100, ±1%, 1/5W, Metal	DRE999131
R0405	Same as R0402	
R0406	Res., 10K, ±20%, 0.5W, Cermet	DRV410561
R0407	Res., 47, ±5%, 1/8W, Carbon	DRZ840271
R0408	Res., 1.8K, ±1%, 1/5W, Metal	DRE999281
R0409	Res., 120, ±1%, 1/5W, Metal	DRE999141
R0410	Same as R0408	
R0411	Same as R0407	
R0412	Res., 2.2K, ±1%, 1/5W, Metal	DRE999291
R0413	Same as R0404	
R0414	Res., 68, ±5%, 1/8W, Carbon	DRZ840311
R0415	Res., 200, Var, 0.3W, Cermet	DRV412011
R0416	Same as R0414	
R0417	Same as R0414	
R0418	Res., 2.7K, ±1%, 1/5W, Metal	DRE999301
R0419	Same as R0418	
R0420	Res., 47K, ±5%, 1/8W, Carbon	DRZ840991
R0421	Same as R0414	
R0422	Res., 680, ±1%, 1/5W, Metal	DRE999231
R0424	Same as R0412	
R0425	Same as R0412	
R0426	Same as R0422	
R0428	Res., 6.8K, ±5%, 1/8W, Carbon	DRZ840791
R0429	Res., 2.2K, ±5%, 1/8W, Carbon	DRZ840671
R0430	Res., 220, ±1%, 1/5W, Metal	DRE999171
R0431	Same as R0430	
R0433	Res., 0Ω	DRZ841601
R0434	Same as R0433	
R0435	Same as R0429	
R0436	Same as R0429	
R0437	Same as R0433	
R0438	Same as R0433	
R0339	Res., 560, ±1%, 1/5W, Metal	DRE999221
R0440	Same as R0439	
R0441	Res., 50K, Var, 0.3W, Cermet	DRV412061
R0442	Same as R0441	
R0444	Res., 180, ±1%, 1/5W, Metal	DRE999161
R0445	Res., 20K, Var, 0.3W, Cermet	DRV412161
R0446	Res., 1K, Var, 0.3W, Cermet	DRV412031
R0447	Res., 100, ±5%, 1/8W, Carbon	DRZ840351
R0448	Same as R0447	
R0449	Res., 220, ±5%, 1/8W, Carbon	DRZ840431
R0450	Same as R0449	
R0451	Same as R0444	
R0452	Res., 100, ±5%, Thermistor	DDD080331
R0453	Res., 100, ±20%, 0.5W, Cermet	DRV410501
R0454	Res., 5K, Var., 0.3W, Cermet	DRV412051
R0455	Same as R0454	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
R0456	Res., 3.3K, ±5%, 1/4W, Carbon	DRD134951
R0457	Same as R0446	
R0459	Res., 620, ±1%, 1/5W, Metal	DRE999761
R0460	Same as R0459	
R0461	Res., 390, ±5%, 1/8W, Carbon	DRZ840491
R0462	Same as R0461	
R0463	Same as R0408	
R0464	Same as R0408	
R0465	Res., 10K, Var, 0.3W, Cermet	DRV411991
R0466	Same as R0465	
R0467	Res., 68K, ±1%, 1/5W, Metal	DRE999351
R0468	Res., 1.0K, ±1%, 1/5W, Metal	DRE999251
R0469	Res., 15K, ±5%, 1/8W, Carbon	DRZ840871
R0470	Res., 22K, ±5%, 1/8W, Carbon	DRZ840911
R0471	Same as R0420	
R0472	Same as R0420	
R0473	Same as R0470	
R0474	Res., 7.5K, ±0.5%, 1/5W, Metal	DRE998401
R0475	Same as R0402	
R0476	Same as R0474	
R0477	Res., 5K, ±20%, 0.5W, Cermet	DRV410551
R0478	Same as R0402	
R0479	Same as R0402	
R0480	Same as R0402	
R0481	Same as R0402	
R0482	Res., 100K, ±20%, 0.5W, Cermet	DRV410591
R0483	Res., 330K, ±1%, 1/2W, Metal	DRE998121
R0484	Same as R0469	
R0485	Same as R0470	
R0486	Same as R0469	
R0487	Same as R0470	
R0488	Same as R0420	
R0489	Same as R0420	
R0490	Same as R0470	
R0491	Res., 27K, ±1%, 1/5W, Metal	DRE999421
R0492	Res., 56K, ±1%, 1/5W, Metal	DRE999461
R0493	Same as R0492	
R0494	Res., 470, ±5%, 1/8W, Carbon	DRZ840511
R0495	Res., 1K, ±5%, Thermistor	DDD080421
R0496	Res., 2.4K, ±1%, 1/5W, Metal	DRE999791
R0497	Same as R0491	
R0498	Same as R0407	
R0499	Same as R0407	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
D0401	Z. Diode, RD 5.6 EB, NEC	DDD032941
Q0401	Transistor, 2SC3098, TOS	DTR830101
Q0402	Same as Q0401	
Q0403	Same as Q0401	
Q0404	Same as Q0401	
Q0405	Transistor, 2SA1206, NEC	DTR115301
Q0406	Same as Q0405	
Q0407	Transistor, 2SC1621, NEC	DTR838021
Q0408	Same as Q0407	
Q0409	Same as Q0401	
Q0410	Same as Q0401	
Q0411	Transistor, 2SC1907, NEC	DTR137611
Q0412	Same as Q0411	
Q0413	Transistor, 3SK129, MAT	DTR137611
Q0414	Transistor, 2SA1162, TOS	DTR810031
Q0415	Transistor, 2SC2712, TOS	DTR830041
Q0416	Same as Q0414	
Q0417	Same as Q0414	
Q0418	Same as Q0415	
Q0419	Same as Q0414	
IC0401	IC, μPC 251C, NEC	DIC610091
IC0403	IC, μPC 624C, NEC	DIC641761
IC0404	IC, MC 74HC 595N, MOT	DIC445961
RL0421	Relay, SY-12	DKD027301

CH-1 PRE AMP (II) 05

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C0502	Cap., 1000p, ±10%, 50V, Cer	DCC810051
C0503	Same as C0502	
C0504	Cap., 0.01μ, ±10%, 50V, Cer	DCC810171
C0505	Same as C0504	
C0506	Same as C0504	
C0509	Cap., 29p, ±5%, 50V, Cer	DCC815201
C0512	Same as C0405	
C0514	Same as C0504	
C0515	Cap., 22p, ±5%, 50V, Cer	DCC815191
C0516	Same as C0504	
C0519	Same as C0504	
C0520	Same as C0504	
C0521	Same as C0504	
C0522	Same as C0504	
C0523	Same as C0504	
C0524	Same as C0504	
C0530	Cap., 68p, ±5%, 50V, Cer	DCC815251
R0501	Res., 3.3K, ±1%, 1/5W, Metal	DRE999311
R0502	Same as R0501	
R0503	Res., 56, ±1%, 1/5W, Metal	DRE999101
R0504	Res., 100, Var, 0.3W, Cermet	DRV412001
R0505	Res., 47, ±5%, 1/8W, Carbon	DRZ840271
R0506	Same as R0505	
R0507	Res., 820, ±5%, 1/8W, Carbon	DRZ840571
R0508	Same as R0507	
R0509	Res., 10K, Var, 0.3W, Cermet	DRV411991
R0510	Res., 5.6K, ±1%, 1/5W, Metal	DRE999341
R0511	Res., 12K, ±1%, 1/5W, Metal	DRE999381
R0512	Res., 1.0K, ±5%, 1/8W, Carbon	DRZ840591
R0513	Same as R0512	
R0514	Res., 180, ±1%, 1/5W, Metal	DRE999161
R0515	Same as R0514	
R0516	Res., 3.3K, ±5%, 1/8W, Carbon	DRZ840711
R0517	Res., 20K, Var, 0.3W, Cermet	DRV412161
R0520	Res., 100, ±5%, 1/8W, Carbon	DRZ840351
R0521	Same as R0520	
R0522	Res., 220, ±5%, 1/8W, Carbon	DRZ840431
R0523	Same as R0516	
R0524	Same as R0516	
R0525	Same as R0505	
R0526	Same as R0505	
R0529	Res., 1.8K, ±1%, 1/5W, Metal	DRE999281
R0530	Same as R0529	
R0531	Res., 100, ±1%, 1/5W, Metal	DRE999131
R0532	Res., 20, ±5%, 1/8W, Carbon	DRZ840181
R0535	Res., 470, ±1%, 1/5W, Metal	DRE999211
R0536	Res., 330, ±1%, 1/5W, Metal	DRE999191
R0537	Same as R0529	
R0538	Same as R0529	
R0539	Res., 1K, Var, 0.3W, Cermet	DRV412031
R0540	Res., 10K, ±1%, 1/5W, Metal	DRE999371
R0541	Res., 4.7K, ±1%, 1/5W, Metal	DRE999331
R0542	Same as R0539	
R0543	Res., 1.0K, ±1%, 1/5W, Metal	DRE999251
R0544	Res., 1.5K, ±1%, 1/5W, Metal	DRE999271
R0546	Same as R0539	
R0547	Same as R0505	
R0548	Res., 470, ±5%, 1/8W, Carbon	DRZ840511
R0549	Same as R0544	
R0550	Same as R0505	
R0551	Same as R0505	
R0552	Same as R0548	
R0553	Same as R0544	
R0554	Same as R0505	
R0557	Same as R0516	
R0558	Same as R0516	
R0559	Res., 4.7K, ±5%, 1/8W, Carbon	DRZ840751
R0562	Res., 1.8K, ±5%, 1/8W, Carbon	DRZ840651
R0563	Same as R0562	
R0564	Same as R0562	
R0565	Res., 10K, ±5%, 1/8W, Carbon	DRZ840831
R0566	Same as R0559	
D0501	Diode, 1SS181, TOS	DDD810061
D0502	Diode, 1SS184, TOS	DDD810071
D0503	Diode, 1SS226, TOS	DDD810081
D0504	Same as D0503	
D0505	Diode, 1SS97, NEC	DDD010451
D0506	Same as D0505	
Q0501	Transistor, 2SC3098, TOS	DTR830101
Q0502	Same as Q0501	
Q0505	Transistor, 2SC1621, NEC	DTR838021

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.	CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
Q0506	Same as Q0505				
Q0507	Transistor, 2SC3120, TOS	DTR830111			
Q0508	Same as Q0507				
Q0509	Transistor, 2SA1162, TOS	DTR810031			
Q0510	Same as Q0509				
Q0511	Same as Q0509				
Q0512	Same as Q0507				
Q0513	Same as Q0507				
Q0514	Transistor, 2SC2712, TOS	DTR830041			
IC0501	IC, MC74HC595N	DIC445961			
IC0502	IC, μPC648C, NEC	DIC641851			
IC0503	IC, SN741S14N, TEXS	DIC140151			
J0501	Connector, M31-M87-07	DCN034501			
J0502	Connector, M36-M87-03	DCN034611			
J0503	Same as J0502				
J0504	Connector, M36-M87-02	DCN034601			
J0505	Same as J0504				
P0501	Connector, M33-07-30-134P	DCN034791			
P0502	Connector, M36-03-30-134P	DCN034911			
P0503	Same as P0502				
P0504	Connector, M36-02-30-134P	DCN034901			
P0505	Same as P0504				

CH-2 PRE AMP (II) 06

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C0602	Cap., 1000p, ±10%, 50V, Cer	DCC810051
C0603	Same as C0602	
C0604	Cap., 0.01μ, ±10%, 50V, Cer	DCC810171
C0605	Same as C0604	
C0606	Same as C0604	
C0609	Cap., 220, ±5%, 50V, Cer	DCC815191
C0612	Same as C0604	
C0624	Same as C0604	
C0650	Cap., 22μ, ±20%, 25V, Elect	DCE225151
C0651	Same as C0650	
C0652	Same as C0650	
L0601	Coil, K5 T4-8-2	DCL152061
L0602	Same as L0601	
L0603	Same as L0601	
R0601	Res., 3.3K, ±1%, 1/5W, Metal	DRE999311
R0602	Same as R0601	
R0603	Res., 100, Var, 0.3W, Cermet	DRV412001
R0604	Res., 56, ±1%, 1/5W, Metal	DRE999101
R0605	Res., 47, ±5%, 1/8W, Carbon	DRZ840271
R0606	Same as R0605	
R0607	Res., 820, ±5%, 1/8W, Carbon	DRZ840571
R0608	Same as R0607	
R0609	Res., 10K, Var, 0.3W, Cermet	DRV411991
R0610	Res., 5.6K, ±1%, 1/5W, Metal	DRE999341
R0611	Res., 12K, ±1%, 1/5W, Metal	DRE999381
R0612	Res., 1.0K, ±5%, 1/8W, Carbon	DRZ840591
R0613	Same as R0612	
R0614	Res., 180, ±1%, 1/5W, Metal	DRE999161
R0615	Same as R0614	
R0616	Same as R0601	
R0617	Res., 20K, Var, 0.3W, Cermet	DRV412161
R0620	Res., 100, ±5%, 1/8W, Carbon	DRZ840351
R0621	Same as R0620	
R0622	Same as R0614	
R0623	Res., 3.3K, ±5%, 1/8W, Carbon	DRZ840711
R0624	Same as R0623	
R0625	Same as R0605	
R0626	Same as R0606	
R0629	Res., 1.8K, ±1%, 1/5W, Metal	DRE999281
R0630	Same as R0629	
R0631	Res., 100, ±1%, 1/5W, Metal	DRE999131
R0632	Res., 220, ±5%, 1/8W, Carbon	DRZ840431
R0635	Res., 470, ±1%, 1/5W, Metal	DRE999211
R0644	Res., 1.5K, ±1%, 1/5W, Metal	DRE999271
R0646	Res., 1K, Var, 0.3W, Cermet	DRV412031
R0647	Same as R0605	
R0648	Res., 470, ±5%, 1/8W, Carbon	DRZ840511
R0649	Same as R0644	
R0650	Same as R0605	
D0601	Diode, 1SS181, TOS	DDD810061
D0605	Diode, 1SS97, NEC	DDD010451
D0606	Same as D0605	
Q0601	Transistor, 2SC3098, TOS	DTR830101
Q0602	Same as Q0601	
Q0605	Transistor, 2SC1621, NEC	DTR838021
Q0606	Same as Q0605	
Q0607	Transistor, 2SC3120, TOS	DTR830111
Q0608	Same as Q0607	
Q0612	Same as Q0607	
IC0601	IC, MC74HC595N, MOT	DIC445961
IC0602	IC, μPC648C, NEC	DIC641861
IC0603	Same as IC0601	
J0601	Connector, M36-M87-03	DCN034611
J0602	Connector, M36-M87-04	DCN034621
J0603	Connector, M36-M87-02	DCN034601
P0601	Connector, M36-03-30-134P	DCN034911
P0602	Connector, M36-04-30-134P	DCN034921
P0603	Connector, M36-02-30-134P	DCN034901

CH-1 PRE AMP (III) [07]

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C0701	Cap., 0.01μ, ±10%, 50V, Cer	DCC810171
C0702	Cap., 1000p, ±10%, 50V, Cer	DCC810051
C0703	Same as C0702	
C0706	Same as C0701	
C0707	Same as C0702	
C0708	Same as C0702	
C0709	Same as C0701	
C0710	Same as C0701	
C0711	Same as C0702	
C0712	Same as C0702	
C0715	Same as C0701	
C0721	Cap., 47μ, ±20%, 25V, Elect	DCE929071
C0723	Same as C0721	
C0724	Cap., 10μ, ±20%, 100V, Elect	DCE255061
C0725	Same as C0721	
C0726	Same as C0721	
C0727	Same as C0721	
C0728	Cap., 0.01μ, ±10%, 50V, Cer	DCC810171
C0729	Cap., 0.01μ, ±10%, 50V, Cer	DCC133501
C0730	Same as C0729	
C0731	Same as C0729	
L0701	Coil, K5 T4-8-2	DCL152061
L0702	Same as L0701	
L0703	Same as L0701	
R0701	Res., 1.5K, ±1%, 1/5W, Metal	DRE999271
R0702	Same as R0701	
R0705	Res., 47, ±5%, 1/8W, Carbon	DRZ840271
R0706	Same as R0705	
R0709	Res., 2.2K, ±5%, 1/8W, Carbon	DRZ840671
R0710	Res., 4.7K, ±5%, 1/8W, Carbon	DRZ840751
R0715	Res., 330, ±5%, 1/8W, Carbon	DRZ840471
R0716	Res., 2K, Var., 0.3W, Cermet	DRV412041
R0717	Res., 220, ±1%, 1/5W, Metal	DRE999171
R0818	Same as R0715	
R0719	Res., 100, ±5%, 1/8W, Carbon	DRZ840351
R0720	Same as R0719	
R0723	Res., 10K, ±1%, 1/5W, Metal	DRE999371
R0724	Same as R0723	
R0725	Res., 68, ±1%, 1/5W, Metal	DRE999111
R0726	Same as R0725	
R0727	Same as R0723	
R0728	Same as R0723	
R0729	Same as R0705	
R0730	Same as R0705	
R0731	Res., 1.5K, ±5%, 1/8W, Carbon	DRZ840631
R0732	Res., 180, ±5%, 1/8W, Carbon	DRZ840411
R0733	Same as R0732	
R0734	Res., 1.2K, ±1%, 1/5W, Metal	DRE999261
R0735	Res., 62, ±1%, 1/5W, Metal	DRE999681
R0736	Res., 3.9K, ±5%, 1/8W, Carbon	DRZ840731
R0737	Same as R0736	
R0738	Res., 1.0K, ±1%, 1/5W, Metal	DRE999251
R0739	Same as R0732	
R0740	Same as R0701	
R0741	Same as R0701	
R0742	Res., 200, Var., 0.3W, Cermet	DRV412011
R0743	Res., 47, ±1%, 1/5W, Metal	DRE999091
R0745	Same as R0732	
R0746	Res., 680, ±1%, 1/5W, Metal	DRE999231
R0747	Same as R0746	
R0748	Same as R0719	
R0749	Same as R0719	
R0750	Res., 1.8K, ±1%, 1/5W, Metal	DRE999281
R0751	Same as R0750	
R0752	Same as R0723	
R0753	Same as R0723	
R0754	Res., 4.7K, ±1%, 1/5W, Metal	DRE999331
R0755	Res., 68K, ±1%, 1/5W, Metal	DRE999471
R0756	Res., 100K, Var., 0.3W, Cermet	DRV412131
R0758	Res., 1K, Var., 0.3W, Cermet	DRV412031
R0760	Res., 10K, Var, 0.3W, Cermet	DRZ840111
R0761	Same as R0760	
R0762	Res., 1.8K, ±5%, 1/8W, Carbon	DRZ840651
R0763	Same as R0762	
R0765	Res., 0Ω	DRZ841601
R0766	Same as R0765	
Q0703	Transistor, 2SA1245MD, TOS	DTR810021
Q0704	Same as Q0703	
Q0705	Same as Q0703	
Q0706	Same as Q0703	
Q0707	Transistor, 2SC1621-TIB, NEC	DTR838021

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
Q0708	Same as Q0707	
Q0809	Same as Q0703	
Q0710	Same as Q0703	
Q0711	Same as Q0707	
Q0712	Same as Q0707	
Q0713	Transistor, 2SA1162, TOS	DTR810031
IC0701	IC, μPC251C, NEC	DIC610091
IC0702	Same as IC0701	
J0701	Connector, M36-M87-03	DCN034611
J0702	Connector, M36-M87-06	DCN034641
P0701	Connector, M36-03-30-114P	DCN034861
P0702	Connector, M36-06-30-134P	DCN034941

CH-2 PRE AMP (III) 08

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C0801	Cap., 0.01μ, ±10%, 50V, Cer	DCC810171
C0802	Cap., 1000p, ±10%, 50V, Cer	DCC810051
C0803	Same as C0802	
C0804	Same as C0801	
C0805	Same as C0801	
C0806	Same as C0801	
C0807	Same as C0802	
C0808	Same as C0802	
C0809	Same as C0801	
C0810	Same as C0801	
C0811	Same as C0802	
C0812	Same as C0802	
C0815	Same as C0801	
C0821	Cap., 47μ, ±20%, 25V, Elect	DCE929071
C0823	Same as C0821	
R0801	Res., 1.5K, ±1%, 1/5W, Metal	DRE999271
R0802	Same as R0801	
R0803	Res., 47, ±5%, 1/8W, Carbon	DRZ840271
R0804	Same as R0803	
R0805	Same as R0803	
R0806	Same as R0803	
R0807	Res., 2.2K, ±5%, 1/8W, Carbon	DRZ840671
R0808	Res., 15K, ±5%, 1/8W, Carbon	DRZ840871
R0809	Same as R0807	
R0810	Same as R0808	
R0811	Res., 6.8K, ±5%, 1/8W, Carbon	DRZ840791
R0812	Same as R0811	
R0813	Res., 4.7K, ±5%, 1/8W, Carbon	DRZ840751
R0814	Same as R0808	
R0815	Res., 330, ±5%, 1/8W, Carbon	DRZ840471
R0816	Res., 2K, Var., 0.3W, Cermet	DRV412041
R0817	Res., 220, ±1%, 1/5W, Metal	DRE999171
R0818	Same as R0815	
R0819	Res., 100, ±5%, 1/8W, Carbon	DRZ840351
R0820	Same as R0819	
R0821	Res., 20K, Var., 0.3W, Cermet	DRV412101
R0822	Res., 3.3K, ±5%, 1/8W, Carbon	DRZ840711
R0823	Res., 10K, ±1%, 1/5W, Metal	DRE999371
R0825	Res., 68, ±1%, 1/5W, Metal	DRE999111
R0826	Same as R0825	
R0827	Same as R0823	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
R0828	Same as R0823	
R0829	Same as R0803	
R0830	Same as R0803	
R0831	Res., 1.5K, ±5%, 1/8W, Carbon	DRZ840631
R0832	Res., 180, ±5%, 1/8W, Carbon	DRZ840411
R0833	Same as R0832	
R0834	Res., 1.2K, ±1%, 1/5W, Metal	DRE999261
R0835	Res., 62, ±1%, 1/5W, Metal	DRE999681
R0836	Res., 3.9K, ±5%, 1/8W, Carbon	DRZ840731
R0837	Same as R0836	
R0838	Res., 1.0K, ±1%, 1/5W, Metal	DRE999251
R0839	Same as R0832	
R0840	Res., 1.5K, ±1%, 1/5W, Metal	DRE999271
R0841	Same as R0840	
R0842	Res., 500, Var., 0.3W, Cermet	DRV412071
R0843	Res., 47, ±1%, 1/5W, Metal	DRE999091
R0845	Same as R0832	
R0846	Res., 680, ±1%, 1/5W, Metal	DRE999231
R0847	Same as R0846	
R0848	Same as R0819	
R0849	Same as R0819	
R0850	Res., 1.8K, b1%, 1/5W, Metal	DRE999281
R0851	Same as R0850	
R0852	Same as R0823	
R0853	Same as R0823	
R0854	Res., 4.7K, ±1%, 1/5W, Metal	DRE999331
R0855	Res., 68K, ±1%, 1/5W, Metal	DRE999471
R0856	Res., 100K, Var., 0.3W, Cermet	DRV412181
R0858	Res., 1.0K, Var, 0.3W, Cermet	DRV412081
R0860	Res., 10, ±5%, 1/8W, Carbon	DRZ840111
R0861	Same as R0860	
R0862	Res., 1.8K, ±5%, 1/8W, Carbon	DRZ840651
R0863	Same as R0862	
Q0801	Transistor, 2SA1245MD, TOS	DTR810021
Q0802	Same as Q0801	
Q0803	Same as Q0801	
Q0804	Same as Q0801	
Q0805	Same as Q0801	
Q0806	Same as Q0801	
Q0807	Transistor, 2SC1621-TIB, NEC	DTR838021
Q0808	Same as Q0807	
Q0809	Same as Q0801	
Q0810	Same as Q0801	
Q0811	Same as Q0807	
Q0812	Same as Q0807	
Q0813	Transistor, 2SA1162, TOS	DTR810031
Q0814	Transistor, 2SC2712, TOS	DTR830041
Q0815	Same as Q0814	
IC0801	IC, μPC251C, NEC	DIC610091
IC0802	Same as IC0801	
J0801	Connector, M36-M87-03	DCN034611
P0801	Connector, M36-03-30-114P	DCN034951

VERT SWITCH 09

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C0901	Cap., 47μ, ±20%, 25V, Elect	DCE929071
C0902	Same as C0901	
C0903	Same as C0901	
C0904	Cap., 0.01μ, ±10%, 50V, Cer	DCC810171
C0905	Cap., 22p, ±5%, 50V, Cer	DCC815191
C0906	Cap., 1000p, ±20%, 50V, Cer	DCC810051
C0807	Same as C0906	
C0808	Cap., 10p, ±5%, 50V, Cer	DCC815171
C0809	Cap., 150p, ±5%, 50V, cer	DCC815291
C0910	Same as C0909	
C0911	Same as C0911	
C0912	Same as C0904	
C0913	Same as C0904	
C0914	Same as C0904	
C0915	Same as C0904	
C0916	Cap., 18p, ±5%, 50V, Cer	DCC815181
C0917	Same as C0904	
C0919	Same as C0904	
C0920	Same as C0906	
C0921	Same as C0909	
C0930	Same as C0904	
C0931	Same as C0904	
C0932	Same as C0904	
C0933	Same as C0904	
C0934	Same as C0904	
C0941	Cap., 8p, ±5%, 50V, Cer	DCC815171
R0901	Res., 15, ±5%, 1/8W, Carbon	DRZ840151
R0902	Same as R0901	
R0903	Same as R0901	
R0904	Same as R0901	
R0905	Res., 2.4K, ±1%, 1/5W, Metal	DRE999791
R0906	Same as R0905	
R0907	Res., 680, ±1%, 1/2W, Metal	DRE140791
R0908	Same as R0907	
R0909	Res., 120, ±1%, 1/5W, Metal	DRE999141
R0910	Same as R0909	
R0911	Res., 180, ±1%, 1/5W, Metal	DRE999161
R0912	Same as R0911	
R0913	Res., 390, ±5%, 1/8W, Carbon	DRZ840491
R0914	Same as R0913	
R0915	Res., 270, ±1%, 1/5W, Metal	DRE999181
R0916	Same as R0915	
R0917	Res., 47, ±5%, 1/8W, Carbon	DRZ840271
R0918	Same as R0917	
R0919	Res., 100K, ±5%, 1/8W, Carbon	DRZ841071
R0920	Res., 2.2K, ±5%, 1/8W, Carbon	DRZ840671
R0921	Same as R0920	
R0922	Res., 10K, ±5%, 1/8W, Carbon	DRZ840831
R0923	Same as R0922	
R0924	Same as R0922	
R0925	Res., 20K, ±5%, 1/8W, Carbon	DRZ840901
R0926	Res., 100, ±5%, 1/8W, Carbon	DRZ840351
R0927	Same as R0926	
R0928	Same as R0925	
R0929	Res., 220, ±5%, 1/8W, Carbon	DRZ840431
R0931	Same as R0920	
R0932	Same as R0920	
R0933	Res., 1.8K, ±5%, 1/8W, Carbon	DRZ840651
R0934	Same as R0933	
R0935	Same as R0933	
R0936	Res., 12K, ±1%, 1/5W, Metal	DRE999381
R0937	Res., 22K, ±1%, 1/5W, Metal	DRE999411
R0938	Res., 47K, ±1%, 1/5W, Metal	DRE999451
R0939	Same as R0926	
R0940	Same as R0926	
R0941	Res., 1.5K, ±1%, 1/5W, Metal	DRE999271
R0942	Res., 82, ±5%, 1/8W, Carbon	DRZ840391
R0943	Same as R0941	
R0944	Res., 220, ±1%, 1/5W, Metal	DRE999171
R0945	Res., 2.2K, ±1%, 1/5W, Metal	DRE999291
R0946	Res., 2K, Var., 0.3W, Cermet	DRV412171
R0947	Same as R0917	
R0948	Res., 1.0K, ±5%, 1/8W, Carbon	DRZ840591
R0949	Same as R0917	
R0950	Same as R0945	
R0951	Res., 500, Var., 0.3W, Cermet	DRV412021
R0952	Res., 0, Jumpper wire, 0.12W, Metal	DRZ841601
R0953	Same as R0922	
R0954	Same as R0922	
R0955	Same as R0922	
R0956	Same as R0922	
R0957	Res., 4.7K, ±5%, 1/8W, Carbon	DRZ840111

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
R0958	Same as R0957	
R0960	Res., 56, ±5%, 1/8W, Carbon	DRZ840291
R0961	Res., 5.6K, ±5%, 1/8W, Carbon	DRZ840771
R0964	Same as R0952	
R0966	Res., 1.5K, ±5%, 1/8W, Carbon	DRZ840631
R0970	Same as R0952	
R0971	Same as R0952	
D0901	Diode, 1SS181, TOS	DDD810061
D0902	Same as D0901	
D0903	Same as D0901	
D0904	Same as D0901	
D0906	Diode, 1SS226, TOS	DDD810081
D0908	Diode, 1SS184, TOS	DDD810071
D0909	Same as D0906	
D0910	Same as D0906	
Q0901	Transistor, 2SC2037, NEC	DTR137591
Q0902	Same as Q0901	
Q0903	Transistor, 2SC2712, TOS	DTR830041
Q0904	Transistor, 2SA1162, TOS	DTR810031
Q0905	Same as Q0904	
Q0907	Transistor, 2SA1245MD, TOS	DTR810021
Q0908	Same as Q0807	
Q0909	Same as Q0907	
Q0910	Same as Q0903	
Q0911	Same as Q0904	
Q0912	Same as Q0903	
IC0901	IC, MC74HC595N, MOT	DIC445961
IC0902	Same as IC0901	
IC0903	IC, μPC624C, NEC	DIC641761
IC0904	IC, SN74LS112N, TEXS	DIC141111
IC0905	IC, SN74LS00N, TEXS	DIC140011
IC0906	IC, SN74LS14N, TEXS	DIC140151
J0901	Connector, M31-M87-07	DCN034501
J0902	Connector, M36-M87-02	DCN034601
P0901	Connector, M33-07-30-134P	DCN034791
P0902	Connector, M36-02-30-134P	DCN034901
P0903	Connector, M33-04-30-114P	DCN034661
DL0901	Delay cable, DC 3, 80 cm	KHB048111

V OUTPUT AMP [10]

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C1003	Cap., 0.01μ, ±10%, 50V, Cer	DCC810171
C1004	Same as C1003	
C1005	Cap., 1000p, ±10%, 50V, Cer	DCC810051
C1006	Cap., 27p, ±5%, 50V, Cer	DCC815201
C1007	Same as C1005	
C1008	Same as C1005	
C1009	Same as C1003	
C1010	Same as C1005	
C1011	Same as C1005	
C1013	Cap., 6p, ±0.5%, 50V, Cer	DCC815111
C1014	Cap., 2~12p, Var., 250V, Cer	DCV019602
C1015	Same as C1005	
C1016	Same as C1005	
C1017	Same as C1003	
C1018	Same as C1005	
C1019	Same as C1003	
C1021	Same as C1003	
C1022	Same as C1005	
C1023	Same as C1005	
C1025	Same as C1005	
C1026	Same as C1005	
C1027	Same as C1003	
C1028	Same as C1003	
C1029	Same as C1005	
C1030	Same as C1003	
C1031	Same as C1003	
C1034	Same as C1003	
C1035	Same as C1014	
C1036	Same as C1014	
C1038	Same as C1003	
C1039	Same as C1005	
C1040	Same as C1003	
C1041	Same as C1003	
C1042	Cap., 10, ±0.5pF, 50V, Cer	DCC815151
C1043	Same as C1003	
C1044	Same as C1005	
C1045	Same as C1005	
C1047	Cap., 220p, ±5%, 50V, Cer	DCC815311
C1050	Cap., 22μ, ±20%, 25V, Elect	DCE225151
C1051	Same as C1050	
C1052	Same as C1050	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
L1003	Peaking coil	DCL151301
L1004	Same as L1003	
L1005	Coil, K5T4-8-2	DCL152061
L1006	Same as L1005	
L1007	Same as L1005	
R1001	Res., 390, ±1%, 1/5W, Metal	DRE999201
R1002	Res., 120, ±1%, 1/5W, Metal	DRE999141
R1003	Res., 5K, Var., 0.3W, Cermet	DRV412051
R1004	Same as R1002	
R1005	Res., 68, ±5%, 1/8W, Carbon	DRZ840311
R1006	Res., 270, ±1%, 1/5W, Metal	DRE999181
R1007	Same as R1005	
R1008	Res., 68, ±1%, 1/5W, Metal	DRE999111
R1009	Same as R1008	
R1010	Res., 240, ±5%, 1/8W, Carbon	DRZ840441
R1011	Res., 82, ±5%, 1/8W, Carbon	DRZ840111
R1012	Res., 10K, ±15%, Thermistor	DDD080431
R1013	Same as R1010	
R1014	Res., 22K, ±%, 1/8W, Carbon	DRZ840911
R1015	Same as R1005	
R1016	Same as R1005	
R1017	Res., 47, ±5%, 1/8W, Carbon	DRZ840271
R1018	Same as R1017	
R1020	Res., 300, ±5%, 1/8W, Carbon	DRZ840461
R1021	Same as R1020	
R1022	Same as R1002	
R1023	Same as R1002	
R1024	Same as R1005	
R1025	Same as R1005	
R1026	Res., 160, ±1%, 1/5W, Metal	DRE999731
R1027	Res., 180, ±5%, 1/8W, Carbon	DRZ840411
R1028	Same as R1027	
R1029	Res., 10K, Var., 0.3W, Cermet	DRV411991
R1030	Res., 200, Var., 0.3W, Cermet	DRV412011
R1031	Res., 390, ±1%, 1/4W, Metal	DRE130731
R1032	Same as R1031	
R1033	Same as R1017	
R1034	Same as R1017	
R1035	Res., 2.7K, ±5%, 1/8W, Carbon	DRZ840691
R1036	Res., 470, ±5%, 1/8W, Carbon	DRZ840511
R1037	Res., 150, ±5%, 1/8W, Carbon	DRZ840391

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
R1038	Same as R1037	
R1039	Res., 100, ±5%, 1/8W, Carbon	DRZ840351
R1040	Same as R1039	
R1041	Res., 3.3K, ±5%, 1/8W, Carbon	DRZ840711
R1042	Same as R1002	
R1043	Same as R1002	
R1044	Same as R1005	
R1045	Res., 1.5K, ±5%, 1/8W, Carbon	DRZ840631
R1046	Res., 5.6K, ±5%, 1/8W, Carbon	DRZ840771
R1047	Same as R1005	
R1048	Res., 22, ±5%, 1/8W, Carbon	DRZ840191
R1049	Res., 100, Var., 0.3W, Cermet	DRV412001
R1050	Same as R1037	
R1051	Same as R1027	
R1052	Same as R1005	
R1053	Res., 47, ±1%, 1/5W, Metal	DRE999091
R1054	Res., 330, ±1%, 1/4W, Metal	DRE130711
R1055	Same as R1054	
R1056	Same as R1005	
R1057	Res., 33, ±5%, 1/8W, Carbon	DRZ840231
R1058	Same as R1037	
R1059	Same as R1048	
R1060	Same as R1027	
R1061	Same as R1053	
R1062	Res., 300, ±1%, 1/4W, Metal	DRE130701
R1063	Res., 1K, ±2%, 1W, Metal	DRE153731
R1064	Same as R1062	
R1065	Same as R1063	
R1066	Res., 270, ±5%, 1/8W, Carbon	DRZ840451
R1067	Same as R1027	
R1068	Same as R1027	
R1069	Res., 560, ±2%, 2W, Metal	DRE163671
R1070	Same as R1069	
R1071	Same as R1017	
R1072	Same as R1039	
R1073	Res., 2.4K, ±5%, 1/8W, Carbon	DRZ840681
R1074	Res., 10K, ±5%, 1/8W, Carbon	DRZ840831
R1076	Res., 330, ±1%, 1/5W, Metal	DRE999191
R1077	Res., 15, ±5%, 1/8W, Carbon	DRZ840151
R1078	Same as R1077	
R1079	Same as R1039	
R1080	Res., 10K, ±1%, 1/5W, Metal	DRE999371
R1081	Res., 1.2K, ±1%, 1/5W, Metal	DRE999261
R1083	Same as R1039	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
R1090	Res., 1.0K, ±5%, 1/8W, Carbon	DRZ840591
R1091	Same as R1045	
R1092	Res., 1.8K, ±5%, 1/8W, Carbon	DRZ840651
R1093	Same as R1090	
R1094	Res., 50K, Var., 0.3W, Cermet	DRV412061
R1095	Res., 22K, ±1%, 1/5W, Metal	DRE999411
R1096	Res., 2.4K, ±1%, 1/5W, Metal	DRE999791
R1097	Res., 360, ±1%, 1/5W, Metal	DRE999611
R1098	Same as R1097	
R1099	Same as R1001	
R10100	Same as R1001	
R10101	Same as R1097	
R10102	Same as R1003	
R10104	Same as R1090	
R10105	Same as R1045	
R10106	Res., 4.7K, ±5%, 1/8W, Carbon	DRZ840111
R10107	Same as R10106	
R10108	Res., 220, ±1%, 1/5W, Metal	DRE999171
R10109	Res., 2.2K, ±5%, 1/8W, Carbon	DRZ840671
R10110	Same as R1003	
R10111	Same as R1027	
R10112	Same as R1027	
R10113	Res., 68, ±5%, 1/8W, Carbon	DRZ840111
R10114	Same as R10113	
R10115	Same as R1039	
R10116	Same as R1045	
R10117	Same as R1045	
R10118	Res., 82, ±5%, 1/8W, Carbon	DRZ840331
R10119	Same as R10118	
R10120	Res., 200, Var., 0.5W, Cermet	DRV410511
R10121	Same as R1029	
R10123	Res., 680, ±1%, 1/5W, Metal	DRE999231
R10124	Same as R10123	
R10125	Res., 15K, ±5%, 1/8W, Carbon	DRZ840871
R10126	Same as R10125	
R10127	Res., 3.9K, ±5%, 1/8W, Carbon	DRZ840731
R10128	Same as R1017	
R10129	Same as R1017	
R10130	Res., 3.6K, ±5%, 1/8W, Carbon	DRZ840721
R10131	Res., 1.2K, ±5%, 1/8W, Carbon	DRZ840611
R10132	Same as R1001	
R10133	Same as R1001	
R10134	Same as R10113	
R10135	Same as R10113	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
R10136	Same as R10113	
R10137	Res., 1.5K, ±1%, 1/5W, Metal	DRE999271
R10138	Res., 750, ±5%, 1/8W, Carbon	DRZ840561
R10139	Res., 1.0K, ±1%, 1/5W, Metal	DRE999251
R10140	Same as R10139	
R10141	Res., 560, ±5%, 1/8W, Carbon	DRZ840531
R10142	Res., 4.7K, ±1%, 1/5W, Metal	DRE999331
R10143	Same as R10142	
R10144	Same as R1097	
R10145	Same as R1017	
R10146	Res., 2.7K, ±1%, 1/5W, Metal	DRE9993301
R10147	Res., 56K, ±1%, 1/5W, Metal	DRE999461
R10148	Res., 100K, Var., 0.3W, Cermet	DRV412131
R10149	Same as R10141	
R10150	Res., 1K, Var., 0.3W, Cermet	DRV412031
R10153	Res., 8.2K, ±5%, 1/8W, Carbon	DRZ840811
R10154	Same as R1012	
R10155	Same as R1014	
R10156	Same as R10131	
R10157	Res., 1K, ±5%, Thermistor	DDD080421
R10158	Res., 3.9K, ±1%, 1/5W, Metal	DRE999321
R10159	Same as R1012	
R10160	Same as R10147	
R10161	Res., 5.6K, ±1%, 1/5W, Metal	DRE999341
R10163	Same as R1048	
R10164	Same as R1048	
D1001	Diode, 1SV69, HIT	DDD011101
D1002	Z. Diode, R05.6EB, NEC	DDD032941
D1003	Diode, 1SS184, TOS	DDD810071
D1004	Same as D1002	
D1005	Same as D1002	
D1006	Same as D1003	
D1007	Same as D1003	
D1008	Same as D1003	
D1009	Same as D1003	
D1010	Same as D1003	
D1011	Same as D1001	
Q1001	Transistor, 2SA1245MD, TOS	DTR810021
Q1002	Same as Q1001	
Q1003	Same as Q1001	
Q1004	Same as Q1001	
Q1005	Transistor, 2SC2408A, NEC	DTR135601
Q1006	Same as Q1005	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
Q1007	Transistor, 2SC3356, NEC	DTR840071
Q1008	Same as Q1007	
Q1009	Transistor, 2SC2712, TOS	DTR830041
Q1010	Same as Q1005	
Q1011	Same as Q1005	
Q1012	Same as Q1005	
Q1013	Same as Q1005	
Q1014	Transistor, 2SC1412, FUJ	DTR130901
Q1015	Same as Q1014	
Q1016	Same as Q1009	
Q1017	Transistor, 2SA1162, TOS	DTR810031
Q1018	Same as Q1009	
Q1024	Same as Q1009	
Q1025	Same as Q1009	
Q1026	Same as Q1009	
Q1027	Same as Q1009	
Q1028	Same as Q1009	
Q1029	Same as Q1009	
Q1030	Same as Q1009	
Q1031	Same as Q1009	
Q1032	Same as Q1017	
Q1033	Transistor, 2SC1621, NEC	DTR838021
Q1034	Same as Q1033	
Q1035	Same as Q1017	
Q1040	Transistor, 2SC3120, TOS	DTR830111
Q1041	Same as Q1040	
Q1042	Same as Q1001	
Q1043	Same as Q1001	
Q1044	Same as Q1001	
Q1045	Same as Q1001	
Q1046	Same as Q1001	
Q1047	Same as Q1007	
Q1048	Same as Q1007	
Q1049	Same as Q1017	
Q1050	Same as Q1009	
Q1051	Same as Q1017	
IC1001	IC, μPC251C, NEC	DIC610091
J1001	Connector, M36-M87-02	DCN034601
J1004	Connector, M36-M87-07	DCN034641
P1001	Connector, M36-02-30-114P	DCN034851
P1003	Connector, M36-04-30-114P	DCN034661
P1004	Connector, M36-06-30-114P	DCN034891

SIG SW FOR ADC [12]

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C1201	Cap., 0.01μ, ±10%, 50V, Cer	DCC810171
C1202	Same as C1201	
C1203	Same as C1201	
C1204	Same as C1201	
C1209	Same as C1201	
C1210	Cap., 1000p, ±10%, 50V, Cer	DCC810051
C1211	Same as C1201	
C1212	Same as C1201	
C1213	Same as C1214	
C1214	Same as C1210	
C1215	Same as C1210	
C1216	Same as C1201	
C1218	Same as C1201	
C1219	Same as C1201	
C1221	Same as C1201	
C1222	Same as C1201	
C1223	Cap., 100μ, ±20%, 16V, Elect	DCE929191
C1224	Same as C1210	
C1225	Same as C1223	
C1226	Same as C1210	
C1227	Same as C1210	
C1228	Same as C1201	
C1229	Same as C1210	
C1230	Same as C1210	
C1235	Same as C1201	
C1236	Same as C1201	
C1237	Same as C1201	
C1238	Same as C1201	
C1240	Same as C1201	
C1241	Same as C1201	
R1201	Res., 47, ±5%, 1/8W, Carbon	DRZ840271
R1202	Same as R1201	
R1203	Same as R1201	
R1204	Same as R1201	
R1205	Res., 1.8K, ±5%, 1/8W, Carbon	DRZ840651
R1206	Same as R1205	
R1207	Res., 1.5K, ±5%, 1/8W, Carbon	DRZ840631
R1208	Same as R1207	
R1211	Res., 10K, ±5%, 1/8W, Carbon	DRZ840831
R1212	Same as R1211	
R1214	Same as R1201	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
R1215	Same as R1201	
R1217	Same as R1201	
R1218	Same as R1201	
R1219	Same as R1201	
R1220	Same as R1201	
R1221	Same as R1205	
R1222	Same as R1205	
R1223	Res., 47, ±1%, 1/5W, Metal	DRE999091
R1224	Same as R1223	
R1230	Res., 330, ±5%, 1/8W, Carbon	DRZ840471
R1231	Same as R1230	
R1232	Same as R1211	
R1233	Same as R1211	
RA1201	Resistor Array, RM6-47KΩK	DFB011281
Q1201	Transistor, SD215DE, SIL	DTR295141
Q1202	Same as Q1201	
Q1203	Same as Q1201	
Q1204	Same as Q1201	
Q1206	Transistor, 2SA1245MD, TOS	DTR810021
Q1207	Same as Q1206	
Q1209	Same as Q1201	
Q1210	Same as Q1201	
Q1212	Same as Q1201	
Q1213	Same as Q1201	
Q1214	Transistor, 2SC1621, NEC	DTR838021
Q1215	Same as Q1214	
IC1201	IC, SN74LS157N, TEXS	DIC141451
IC1202	IC, μPC177C' NEC	DIC630021
IC1203	Same as IC1202	
J1202	Connector, M36-M87-02	DCN034601
J1203	Same as J1202	
P1202	Connector, M36-02-30-135P	DCN034901
P1203	Same as P1202	
	Socket contact, M31C8-4	DCN034951

TRIG COUPLING 13

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C1301	Cap., 0.01μ, ±10%, 50V, Cer	DCC810171
C1302	Cap., 1μ, ±30%, 50V, Elect	DCE244521
C1303	Cap., 0.1μ, ±10%, 50V, Film	DCF120351
C1304	Cap., 2200p, ±10%, 50V, Film	DCF120151
C1305	Cap., 22μ, ±20%, 25V, Elect	DCE225151
C1306	Same as C1301	
C1307	Same as C1301	
C1308	Same as C1301	
C1310	Cap., 12p, ±0.25pF, 500V, Cer	DCC251901
C1311	Cap., 0.047μ, ±20%, 250V, Poly	DCF160291
C1312	Same as C1301	
C1313	Same as C1310	
C1314	Same as C1311	
C1315	Same as C1301	
C1316	Same as C1301	
C1317	Same as C1301	
C1318	Same as C1305	
C1319	Same as C1302	
C1320	Same as C1303	
C1321	Same as C1304	
C1323	Same as C1301	
C1324	Same as C1301	
C1350	Cap., 0.01, -20~+80%, 50V, Cer	
C1351	Same as C1350	
C1352	Same as C1350	
C1353	Same as C1350	
R1301	Res., 100, ±5%, 1/8W, Carbon	DRZ840351
R1302	Res., 33, ±5%, 1/8W, Carbon	DRZ840231
R1303	Res., 47, ±5%, 1/8W, Carbon	DRZ840271
R1304	Same as R1302	
R1305	Same as R1301	
R1306	Same as R1302	
R1308	Same as R1302	
R1309	Same as R1302	
R1311	Res., 2.2K, ±5%, 1/8W, Carbon	DRZ840671
R1312	Same as R1311	
R1313	Same as R1311	
R1314	Same as R1311	
R1315	Same as R1311	
R1316	Res., 680, ±5%, 1/8W, Carbon	DRZ840551
R1317	Same as R1316	
R1318	Same as R1316	
R1319	Same as R1316	
R1320	Same as R1316	
R1321	Same as R1311	
R1322	Same as R1303	
R1323	Same as R1301	
R1324	Res., 1.2K, ±5%, 1/8W, Carbon	DRZ840611
R1325	Same as R1303	
R1326	Res., 3.3K, ±5%, 1/8W, Carbon	DRZ840711
R1327	Same as R1326	
R1328	Res., 0, Jumpper Wire, 0.12W, Metal	DRZ841601
R1329	Same as R1326	
R1330	Same as R1326	
R1331	Res., 10, ±5%, 1/8W, Carbon	DRZ840111
R1332	Res., 1.0K, ±5%, 1/8W, Carbon	DRZ840591
R1333	Res., 10K, ±5%, 1/8W, Carbon	DRZ840831
R1334	Res., 4.7K, ±5%, 1/8W, Carbon	DRZ840751
R1335	Res., 470, ±5%, 1/8W, Carbon	DRZ840511
R1336	Same as R1334	
R1337	Same as R1334	
R1338	Same as R1334	
R1339	Res., 22K, ±5%, 1/8W, Carbon	DRZ840911
R1340	Same as R1339	
R1341	Same as R1326	
R1343	Res., 330, ±5%, 1/8W, Carbon	DRZ840471
R1344	Res., 510, ±5%, 1/8W, Carbon	DRZ840521
R1345	Same as R1344	
R1346	Res., 1.8K, ±5%, 1/8W, Carbon	DRZ840651
R1347	Same as R1346	
R1348	Same as R1346	
R1350	Res., 1 M, ±1%, 1/5W, Metal	DRE998241
R1351	Same as R1350	
R1352	Res., 1M, ±1%, 1/5W, Metal	DRE998241
R1353	Same as R1335	
R1354	Same as R1352	
R1355	Same as R1343	
R1356	Same as R1301	
R1357	Res., 39, ±5%, 1/8W, Carbon	DRZ840251
R1358	Res., 100, ±20%, 0.5W, Cermet	DRV410501
R1363	Same as R1301	
R1364	Same as R1357	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
R1365	Same as R1358	
R1366	Same as R1301	
R1367	Same as R1302	
R1368	Same as R1301	
R1369	Same as R1302	
R1370	Same as R1302	
R1371	Same as R1332	
R1372	Same as R1311	
R1373	Same as R1311	
R1374	Res., 2K, Var., 0.3W, Cermet	DRV412041
R1375	Same as R1374	
R1376	Same as R1332	
R1377	Same as R1303	
R1378	Same as R1301	
R1379	Same as R1324	
R1380	Res., 2.7K, ±5%, 1/8W, Carbon	DRZ840691
R1381	Same as R1303	
R1382	Same as R1326	
R1383	Same as R1326	
R1384	Same as R1328	
R1385	Same as R1333	
R1386	Same as R1332	
R1387	Same as R1334	
R1388	Res., 560, ±5%, 1/8W, Carbon	DRZ840531
R1389	Same as R1334	
R1390	Same as R1334	
R1391	Same as R1339	
R1392	Same as R1339	
R1393	Same as R1326	
R1395	Same as R1343	
R1396	Same as R1331	
R13101	Same as R1350	
R13102	Same as R1350	
R13103	Same as R1350	
R13104	Same as R1350	
RA1301	Resistor Array, RM6-27KΩJ	DFB011391
RA1303	Resistor Array, RM4-680ΩJ	DFB011561
RA1304	Resistor Array, RM4-27KΩJ	DFB011141
D1301	Diode, 1SS184	DDD810071
D1302	Same as D1301	
D1303	Same as D1301	
D1304	Same as D1301	
D1305	Same as D1301	
D1306	Same as D1301	
D1307	Same as D1301	
D1308	Same as D1301	
D1309	Diode, 1S1544A, NEC	DDD010801
D1310	Same as D1309	
D1311	Diode, RD2.0EB, NEC	DDD031711
D1312	Diode, 1SS181, TOS	DDD810061
D1313	Same as D1301	
D1314	Same as D1311	
D1315	Same as D1301	
D1316	Same as D1301	
D1321	Diode, 1SS226, TOS	DDD810081
D1322	Same as D1321	
Q1301	Transistor, 2SC2712, TOS	DTR830041
Q1302	Transistor, 2SC3123, TOS	DTR830121
Q1303	Same as Q1302	
Q1304	Same as Q1302	
Q1305	Same as Q1302	
Q1306	Transistor, 2SA1226, NEC	DTR810071
Q1307	Same as Q1302	
Q1308	Same as Q1301	
Q1309	Same as Q1301	
Q1310	Transistor, μPA61AM, NEC	DTR295281
Q1311	Same as Q1310	
Q1312	Same as Q1302	
Q1313	Same as Q1302	
Q1314	Same as Q1302	
Q1315	Same as Q1306	
Q1316	Same as Q1302	
Q1317	Same as Q1301	
Q1308	Same as Q1301	
IC1301	IC, MC74HC595N, MOT	DIC445961
IC1302	Same as IC1301	
IC1303	IC, SN74LS14N, TEXS	DIC140151
IC1304	Photo coupler, TLP521-2, TOS	DFB030451
IC1305	Photo coupler, TLP521-3, TOS	DFB030441
IC1306	IC, CD4053BE, RCA, TOS, NEC	DIC410521
IC1307	IC, μPC251C, NEC	DIC610091
IC1308	Same as IC1305	
IC1309	Same as IC1306	
IC1310	Same as IC1307	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.	CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
R1359	Same as R1352				
R1360	Same as R1335				
R1361	Same as R1352				
R1362	Same as R1343				
RL1301	Lead relay, URS-123S	DKD065451			
RL1302	Same as RL1301				
J1301	Connector, M36-M87-06	DCN034641			
J1302	Connector, M36-M87-02	DCN034601			
J1303	Connector, M31-M87-08	DCN034511			
J1304	Connector, ZC-012	DCN034661			
J1305	Same as J1302				
P1301	Connector, M36-06-30-114P	DCN034891			
P1302	Connector, M36-02-30-114P	DCN034851			
P1303	Connector, M33-08-30-114P	DCN034701			
P1305	Same as P1302				
	Socket contact, M31C8-4	DCN034951			

A & B TRIG AMP 14

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C1402	Cap., 0.01μ, ±10%, 50V, Cer	DCC815171
C1403	Same as C1402	
C1404	Cap., 15p, ±5%, 50V, Cer	DCC815171
C1406	Same as C1402	
C1407	Same as C1402	
C1408	Same as C1404	
C1409	Same as C1402	
C1410	Cap., 22μ, ±20%, 25V, Elect	DCE225151
C1411	Same as C1402	
C1412	Same as C1410	
C1313	Same as C1410	
C1414	Same as C1402	
C1415	Same as C1410	
R1402	Res., 20K, Var., 0.3W, Cermet	DRV412161
R1403	Res., 10K, ±5%, 1/8W, Carbon	DRZ840831
R1404	Res., 330, ±5%, 1/8W, Carbon	DRZ840471
R1405	Res., 1.0K, ±5%, 1/8W, Carbon	DRZ840591
R1406	Res., 100, ±5%, 1/8W, Carbon	DRZ840351
R1407	Res., 47K, ±5%, 1/8W, Carbon	DRZ840991
R1408	Res., 100K, ±5%, 1/8W, Carbon	DRZ841071
R1409	Same as R1406	
R1410	Res., 47, ±5%, 1/8W, Carbon	DRZ840271
R1412	Same as R1402	
R1413	Same as R1403	
R1414	Same as R1404	
R1415	Same as R1405	
R1416	Same as R1406	
R1417	Same as R1407	
R1418	Same as R1408	
R1419	Same as R1406	
R1420	Same as R1410	
R1421	Res., 910, ±1%, 1/2W, Metal	DRE140821
R1422	Same as R1421	
R1423	Res., 82K, ±5%, 1/8W, Carbon	DRZ841051
R1424	Same as R1423	
D1401	Diode, 1SS184, TOS	DDD810071
D1402	Same as D1401	
Q1401	Transistor, 2SC2712, TOS	DTR830041
Q1402	Same as Q1401	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
IC1401	IC, μPC648C, NEC	DIC641851
IC1402	Same as IC1401	
IC1403	IC, MC74HC595N	DIC445961
IC1404	Same as IC1403	
IC1405	Same as IC1403	
IC1406	B226 HIC, IWA	DIC822262
IC1407	Same as IC1406	

TV SYNC SEPARATOR 15

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C1501	Cap., 47μ, ±20%, 25V, Elect	DCE225171
C1502	Cap., 1μ, ±30%, 50V, Elect	DCE244521
C1504	Same as C1501	
C1505	Cap., 1μ, ±20%, 50V, Elect	DCE245021
C1506	Cap., 0.047μ, ±10%, 50V, Film	DCF120311
C1507	Cap., 470p, ±5%, 50V, Cer	DCC815351
C1511	Cap., 22μ, ±20%, 25V, Elect	DCE225151
C1512	Same as C1511	
R1502	Res., 10K, ±5%, 1/8W, Carbon	DRZ840831
R1503	Res., 1.8K, ±5%, 1/8W, Carbon	DRZ840791
R1504	Res., 6.8K, ±5%, 1/8W, Carbon	DRZ840791
R1505	Same as R1504	
R1506	Res., 82K, ±5%, 1/8W, Carbon	DRZ841051
R1507	Res., 150K, ±5%, 1/8W, Carbon	DRZ841111
R1508	Res., 680, ±5%, 1/8W, Carbon	DRZ840551
R1509	Same as R1502	
R1510	Same as R1502	
R1511	Same as R1507	
R1514	Same as R1507	
R1515	Same as R1503	
R1516	Res., 12K, ±%, 1/8W, Carbon	DRZ840851
R1517	Res., 39K, ±5%, 1/8W, Carbon	DRZ840971
R1518	Same as R1504	
R1519	Same as R1516	
R1520	Same as R1502	
R1521	Res., 470, ±5%, 1/8W, Carbon	DRZ840511
R1522	Res., 1.0K, ±5%, 1/8W, Carbon	DRZ840591
R1523	Res., 2.7K, ±5%, 1/8W, Carbon	DRZ840691
R1524	Res., 18K, ±5%, 1/8W, Carbon	DRZ840891
R1525	Same as R1516	
D1501	Diode, 1SS184, TOS	DDD810071
D1502	Same as D1501	
D1503	Z. Diode, RD4.7EB, NEC	DDD033511
D1504	Same as D1501, TOS	
Q1501	Transistor, 2SA1162, TOS	DTR810031
Q1502	Same as Q1501	
Q1503	Same as Q1501	
Q1504	Same as Q1501	
Q1505	Transistor, 2SC2712, TOS	DTR830041
Q1506	Same as Q1501	
Q1507	Same as Q1505	
Q1508	Same as Q1505	
IC1501	IC, SN74LS08N, TEXS	DIC140091
IC1502	IC, SN74LS02N, TEXS	DIC140031

A SWEEP GENERATOR 16

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C1601	Cap., 220, ±5%, 50V, Cer	DCC815191
C1602	Cap., 120p, ±5%, 50V, Cer	DCC815281
C1603	Same as C1602	
C1604	Cap., 330p, ±5%, 50V, Cer	DCC815331
C1605	Same as C1604	
C1606	Cap., 68p, ±5%, 50V, Cer	DCC815251
C1607	Cap., 150, ±5%, 50V, Cer	DCC815171
C1608	Cap., 2.5~22.5p, Var., 250V, Cer	DCV019592
C1609	Cap., 4.7μ, ±20%, 50V, Elect	DCE245051
C1610	Cap., 5p, ±0.25p, 50V, Cer	DCC815101
C1612	Cap., 0.01μ, ±10%, 50V, Cer	DCC810171
C1613	Cap., 10p, ±0.5%, 50V, Cer	DCC815151
C1614	Cap., 22μ, ±20%, 25V, Elect	DCE225151
C1615	Same as C1614	
C1616	Same as C1614	
C1617	Same as C1614	
C1618	Same as C1612	
C1619	Same as C1612	
C1620	Same as C1612	
R1601	Res., 3.9K, ±5%, 1/8W, Carbon	DRZ840731
R1602	Res., 2.2K, ±5%, 1/8W, Carbon	DRZ840671
R1603	Res., 270, ±5%, 1/8W, Carbon	DRZ840451
R1604	Res., 1.0K, ±5%, 1/8W, Carbon	DRZ840591
R1605	Res., 470, ±5%, 1/8W, Carbon	DRZ840511
R1606	Same as R1604	
R1607	Res., 3.3, ±5%, 1/8W, Carbon	DRZ840711
R1608	Res., 22K, ±5%, 1/8W, Carbon	DRZ840911
R1609	Res., 820, ±1%, 1/5W, Metal	DRE999241
R1610	Res., 5.6K, ±1%, 1/5W, Metal	DRE999341
R1611	Res., 2.2K, ±1%, 1/5W, Metal	DRE999291
R1612	Res., 27K, ±5%, 1/8W, Carbon	DRZ840931
R1613	Res., 4.7K, ±5%, 1/8W, Carbon	DRZ840751
R1614	Same as R1613	
R1615	Same as R1604	
R1616	Same as R1601	
R1617	Same as R1602	
R1618	Same as R1602	
R1619	Res., 5.6K, ±5%, 1/8W, Carbon	DRZ840771
R1620	Same as R1602	
R1623	Res., 10K, ±5%, 1/8W, Carbon	DRZ840831
R1626	Res., 47K, ±5%, 1/8W, Carbon	DRZ840991
R1627	Same as R1604	
R1628	Res., 6.8K, ±5%, 1/8W, Carbon	DRZ840791
R1629	Res., 2K, Var., 0.3W, Cermet	DRV412041
R1630	Same as R1613	
R1631	Same as R1628	
R1632	Same as R1628	
R1633	Same as R1602	
R1634	Res., 1.8K, ±1%, 1/5W, Metal	DRE999281
R1635	Same as R1611	
R1636	Res., 120, ±5%, 1/8W, Carbon	DRZ840371
R1637	Same as R1602	
R1640	Res., 40, ±5%, 1/8W, Carbon	DRZ840151
D1601	Diode 1SS181, TOS	DDD810061
D1602	Diode 1SS184, TOS	DDD810071
D1603	Same as D1602	
D1604	Same as D1601	
D1605	Same as D1601	
Q1603	Transistor, 2SA1162, TOS	DTR810031
Q1604	Transistor, 2SC1621, TOS	DTR838021
Q1605	Transistor, 2SA1226, NEC	DTR810071
IC1601	IC, MC10H107L, MOT	DIC322221
IC1602	IC, F10131DC, FC, MOT, HIT	DIC310081
IC1603	IC, SN74LS123N, TEXS, HIT	DIC141181
IC1604	IC, SN74LS08N, TEXS, HIT	DIC140091
IC1605	IC, SN74LS14N, TEXS, HIT	DIC140011
IC1606	IC, SN74LS14N	DIC140151
IC1608	IC, SN74LS112N, TEXS, HIT	DIC141111
IC1609	IC, MC74HC595N, MOT	DIC445961
IC1610	Same as IC1609	
IC1611	IC, μPC624C, NEC	DIC641761
J1601	Connector, M36-M87-02	DCN034601
P1601	Connector, M36-02-30-134P	DCN034901

A TIMING CR 17

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C1701	Cap., 0.01μF, ±10%, 50V, Cer	DCC810171
C1702	Same as C1701	
C1703	Same as C1701	
C1704	Cap., 1μ, 0.25%, 50V, Film	DCF420281
C1705	Cap., 9900p, ±0.25%, 50V, Film	DCF125791
C1706	Same as C1701	
C1707	Cap., 1500p, ±10%, 50V, Film	DCF120131
C1708	Cap., 0.01μ, ±10%, 50V, Film	DCF120231
C1709	Cap., 0.047μ, ±10%, 50V, Film	DCF120311
C1710	Cap., 0.47μ, -10~+150%, 50V, Elect	DCE245011
C1711	Cap., 2.2μ, ±20%, 50V, Elect	DCE245031
C1712	Cap., 22μ, ±20%, 25V, Elect	DCE225151
C1713	Same as C1701	
R1701	Res., 8.2K, ±1%, 1/5W, Metal	DRE999361
R1702	Res., 39K, ±1%, 1/5W, Metal	DRE999441
R1703	Res., 6.2K, ±5%, 1/8W, Carbon	DRZ840781
R1704	Res., 47, ±5%, 1/8W, Carbon	DRZ840271
R1705	Res., 220, ±5%, 1/8W, Carbon	DRZ840431
R1706	Res., 6.2K, ±1%, 1/5W, Metal	DRE999811
R1707	Res., 4.7K, ±5%, 1/8W, Carbon	DRZ840751
R1708	Same as R1707	
R1709	Same as R1707	
R1710	Res., 390K, ±1%, 1/5W, Carbon	DRE998141
D1702	Diode, 1SS184, TOS	DDD810071
Q1701	Transistor, 2SK30A-GR, TOS	DTR215191
Q1702	Transistor, 2SC2712, TOS	DTR830041
Q1703	Same as Q1702	
Q1704	Same as Q1702	
IC1701	IC, SN74141N, TEXS	DIC126301
IC1702	IC, MC74HC595N, MOT	DIC445961
IC1703	IC, CD4051BE, RCA, NEC, TOS, OKI	DIC410501
IC1704	IC, μPC624C, NEC	DIC641761
IC1705	Same as IC1702	
RL1701	Relay, SY-12	DKD027301
RL1702	Same as RL1701	

B SWEEP GENERATOR 18

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C1801	Cap., 0.01μ, ±10%, 50V, Cer	DCC810171
C1803	Same as C1801	
C1804	Cap., 330p, ±5%, 50V, Cer	DCC815331
C1805	Cap., 22p, ±5%, 50V, Cer	DCC815191
C1807	Cap., 68p, ±5%, 50V, Cer	DCC815251
C1808	Cap., 100p, ±5%, 50V, Cer	DCC815271
C1809	Cap., 10p, ±0.5pF, 50V, Cer	DCC815151
C1810	Cap., 68p, ±5%, 50V, Cer	DCC815251
C1813	Cap., 56p, ±5%, 50V, Cer	DCC815241
C1814	Same as C1801	
C1815	Same as C1801	
C1816	Same as C1801	
C1817	Same as C1801	
C1818	Same as C1801	
C1819	Cap., 15p, ±5%, 50V, Cer	DCC815171
C1820	Same as C1801	
C1821	Cap., 9900p, ±0.25%, 50V, Film	DCF125791
C1822	Cap., 1μ, 0.25%, 50V, Film	DCF420281
C1823	Same as C1801	
C1824	Same as C1801	
C1826	Same as C1801	
C1827	Same as C1801	
C1828	Same as C1801	
C1829	Cap., 47μ, ±20%, 25V, Elect	DCE929071
C1830	Same as C1829	
C1831	Same as C1829	
C1832	Same as C1829	
C1833	Same as C1829	
C1899	Cap., 3.3~20.5p, Var., 250V, Cer	DCV019681
R1801	Res., 3.9, ±5%, 1/8W, Carbon	DRZ840731
R1802	Res., 2.2K, ±5%, 1/8W, Carbon	DRZ840671
R1803	Res., 270, ±5%, 1/8W, Carbon	DRZ840451
R1804	Res., 1.0K, ±5%, 1/8W, Carbon	DRZ840591
R1805	Same as R1804	
R1806	Res., 680, ±5%, 1/8W, Carbon	DRZ840551
R1807	Res., 6.8K, ±5%, 1/8W, Carbon	DRZ840791
R1808	Res., 1.8K, ±5%, 1/8W, Carbon	DRZ840651
R1809	Same as R1802	
R1810	Same as R1802	
R1811	Res., 4.7K, ±5%, 1/8W, Carbon	DRZ840751
R1813	Same as R1802	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
R1815	Same as R1802	
R1816	Same as R1802	
R1817	Res., 3.3K, ±5%, 1/8W, Carbon	DRZ840711
R1818	Same as R1802	
R1819	Same as R1811	
R1820	Res., 3.9K, ±1%, 1/5W, Metal	DRE999321
R1821	Res., 2K, Var., 0.3W, Cermet	DRV412171
R1822	Same as R1820	
R1823	Res., 820, ±1%, 1/5W, Metal	DRE999241
R1824	Res., 5.6K, ±1%, 1/5W, Metal	DRE999341
R1825	Res., 2.2K, ±1%, 1/5W, Metal	DRE999291
R1826	Res., 27K, ±5%, 1/8W, Carbon	DRZ840931
R1827	Same as R1817	
R1830	Same as R1804	
R1831	Res., 1K, Var., 0.3W, Cermet	DRV412081
R1832	Res., 3.6K, ±1%, 1/2W, Metal	DRE140961
R1833	Same as R1817	
R1834	Same as R1801	
R1835	Same as R1826	
R1836	Same as R1826	
R1837	Res., 12K, ±5%, 1/8W, Carbon	DRZ840851
R1838	Res., 820, ±5%, 1/8W, Carbon	DRZ840571
R1839	Res., 100, ±5%, 1/8W, Carbon	DRZ840351
R1841	Res., 8.2K, ±1%, 1/5W, Metal	DRE999361
R1842	Res., 1.0K, ±1%, 1/5W, Metal	DRE999251
R1843	Res., 2.7K, ±1%, 1/5W, Metal	DRE999301
R1844	Same as R1837	
R1845	Same as R1842	
R1846	Same as R1842	
R1847	Same as R1807	
R1848	Res., 10K, Var., 0.3W, Cermet	DRV411991
R1849	Res., 2.7K, ±5%, 1/8W, Carbon	DRZ840691
R1850	Res., 5K, Var., 0.3W, Cermet	DRV412051
R1851	Res., 22K, ±1%, 1/5W, Metal	DRE999411
R1852	Res., 47K, ±1%, 1/5W, Metal	DRE999451
R1853	Same as R1852	
R1855	Same as R1817	
R1857	Same as R1811	
R1858	Same as R1807	
R1859	Same as R1820	
R1860	Same as R1811	
R1861	Same as R1811	
R1866	Res., 18K, ±1%, 1/5W, Metal	DRE999401
R1867	Res., 5K, Var., 0.3W, Cermet	DRV412091
R1868	Same as R1866	
R1869	Res., 220, ±5%, 1/8W, Carbon	DRZ840431
R1870	Res., 47, ±5%, 1/8W, Carbon	DRZ840271
R1871	Res., 390K, ±1%, 1/5W, Carbon	DRE998141
D1801	Diode, 1SS184	DDD810071
D1802	Diode, 1SS181	DDD810061
D1803	Same as D1802	
D1804	Same as D1802	
D1812	Same as D1801	
Q1801	Transistor, 2SC2712, TOS	DTR830041
Q1802	Transistor, 2SC1621, NEC	DTR838021
Q1804	Transistor, 2SA1162, TOS	DTR810031
Q1805	Same as Q1802	
Q1806	Same as Q1802	
Q1807	Same as Q1801	
Q1808	Same as Q1801	
Q1809	Same as Q1802	
IC1801	IC, MC10H107L, MOT	DIC322221
IC1802	IC, F10131DC, FC, MOT, HIT	DIC310081
IC1803	IC, F10116DC, FC, MOT, HIT	DIC310201
IC1804	IC, CA3086, RCA	DTR190381
IC1805	IC, HA17458PS, HIT	DIC613511
IC1806	IC, μPC648C, NEC	DIC641851
IC1807	IC, MC74HC595N, MOT, TOS	DIC445961
IC1808	Same as IC1807	
IC1809	IC, B227	DIC822272
IC1810	IC, SN74141N, TEXS	DIC126301
IC1812	Same as IC1807	
RL1801	Relay, ST-12	DKD027301
RL1802	Same as RL1801	

HORIZ DISP 20

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C2001	Cap., 330p, ±5%, 50V, Cer	DCC815331
C2002	Cap., 1000p, ±10%, 50V, Cer	DCC810051
C2003	Same as C2001	
C2005	Cap., 0.01μ, ±10%, 50V, Cer	DCC810171
C2006	Same as C2005	
C2009	Same as C2005	
C2010	Same as C2001	
C2011	Same as C2005	
C2014	Same as C2005	
C2016	Cap., 100μ, ±20%, 16V, Elect	DCE929191
C2017	Same as C2005	
C2018	Cap., 47μ, ±20%, 25V, Elect	DCE929071
C2020	Same as C2016	
C2021	Same as C2016	
R2001	Res., 33, ±5%, 1/8W, Carbon	DRZ840231
R2002	Res., 1.0K, ±5%, 1/8W, Carbon	DRZ840591
R2003	Res., 1.8K, ±5%, 1/8W, Carbon	DRZ840651
R2004	Same as R2002	
R2005	Res., 4.7K, ±5%, 1/8W, Carbon	DRZ840751
R2006	Res., 820, ±5%, 1/8W, Carbon	DRZ840571
R2007	Same as R2002	
R2008	Res., 10K, ±5%, 1/8W, Carbon	DRZ840831
R2009	Same as R2006	
R2010	Same as R2003	
R2011	Same as R2008	
R2012	Res., 330, ±5%, 1/8W, Carbon	DRZ840471
R2013	Res., 1.0K, ±5%, 1/8W, Carbon	DRZ840831
R2014	Same as R2008	
R2015	Same as R2006	
R2016	Same as R2008	
R2017	Res., 1K, Var., 0.3W, Cermet	DRV412081
R2018	Res., 10K, ±1%, 1/5W, Metal	DRE999371
R2019	Same as R2001	
R2020	Same as R2006	
R2021	Res., 1.0K, ±1%, 1/5W, Metal	DRE999251
R2022	Res., 20K, Var., 0.3W, Cermet	DRV412101
R2023	Same as R2018	
R2024	Res., 4.7K, ±1%, 1/5W, Metal	DRE999331
R2025	Same as R2024	
R2026	Res., 2.2K, ±1%, 1/5W, Metal	DRE999291
R2027	Same as R2008	
R2028	Same as R2008	
R2029	Res., 5.6K, ±1%, 1/5W, Metal	DRE999341
R2030	Same as R2029	
R2031	Res., 6.8K, ±1%, 1/5W, Metal	DRE999351
R2032	Same as R2031	
R2033	Same as R2021	
R2034	Res., 2.7K, ±1%, 1/5W, Metal	DRE999301
R2035	Same as R2017	
R2036	Res., 2.0K, ±1%, 1/5W, Metal	DRE999641
R2037	Res., 8.2K, ±1%, 1/5W, Metal	DRE999361
R2038	Res., 3.3K, ±1%, 1/5W, Metal	DRE999311
R2039	Same as R2034	
R2040	Same as R2034	
R2041	Same as R2034	
R2042	Same as R2034	
R2043	Same as R2034	
R2044	Res., 3.3K, ±5%, 1/8W, Carbon	DRZ840711
R2045	Res., 10, ±5%, 1/8W, Carbon	DRZ840111
R2047	Res., 47K, ±1%, 1/5W, Metal	DRE999451
R2048	Res., 100K, ±1%, 1/5W, Metal	DRE999491
R2049	Same as R2048	
R2050	Same as R2008	
R2051	Same as R2008	
R2052	Same as R2044	
R2053	Same as R2005	
R2054	Res., 2.2K, ±5%, 1/8W, Carbon	DRZ840671
R2055	Same as R2005	
R2056	Same as R2005	
R2057	Res., 470, ±5%, 1/8W, Carbon	DRZ840511
R2060	Same as R2060	
R2061	Same as R2054	
D2001	Diode, 1SS181, TOS	DDD810061
D2002	Same as D2001	
D2003	Same as D2001	
D2004	Same as D2001	
D2005	Same as D2001	
D2006	Diode, 1SS184, TOS	DDD810071
D2007	Same as D2001	
D2008	Diode, 1SS226, TOS	DDD810081
D2009	Same as D2006	
D2010	Same as D2001	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.	CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
D2011	Diode, 1S953, NEC	DDD010051			
D2011	Diode, 1S953, NEC	DDD010051			
D2012	Same as D2011				
D2013	Same as D2011				
D2014	Same as D2001				
D2015	Same as D2006				
D2016	Same as D2001				
D2017	Same as D2001				
D2018	Same as D2008				
Q2001	Transistor, 2SC2712, TOS	DTR830041			
Q2002	Same as Q2001				
Q2003	Same as Q2001				
Q2004	Transistor, 2SC1621, NEC	DTR838021			
Q2005	Same as Q2004				
Q2006	Same as Q2001				
Q2007	Transistor, 2SA1162, TOS	DTR810031			
Q2009	Same as Q2001				
Q2010	Same as Q2007				
Q2011	Same as Q2001				
IC2001	IC, MC74HC595N, MOT, TOS	DIC445961			
IC2002	Same as IC2001				
IC2004	Same as IC2001				
IC2005	IC, μPC648C, NEC	DIC641851			
IC2006	IC, SN74LS10N, TEXS, HIT	DIC140111			
IC2007	IC, SN7406N, TEXS, HIT	DIC110071			
IC2008	Same as IC2007				
IC2009	IC, SN74LS112N, TEXS, HIT	DIC141111			
J2001	Connector, M36-M87-02	DCN034601			
J2002	Connector, M36-M87-03	DCN034611			
J2003	Connector, M31-M87-12	DCN034541			
J2004	Same as J2002				
J2005	Same as J2001				
P2001	Connector, M36-02-30-134P	DCN034901			
P2002	Connector, M36-03-30-114P	DCN034861			
P2003	Connector, M33-12-30-134P	DCN034831			
P2004	Connector, M36-03-30-134P	DCN034911			
P2005	Same as P2001				
	Socket contact, M31C8-4	DCN034951			

HORIZ AMP 22

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C2201	Cap., 0.01μ, ±10%, 50V, Cer	DCC810171
C2202	Same as C2001	
C2205	Same as C2201	
C2209	Cap., 1.5~5.5p, Var., 250V, Cer	DCV019722
C2210	Cap., 1000p, ±10%, 50V, Cer	DCC810051
C2211	Same as C2210	
C2212	Cap., 0.01μ, ±10%, 50V, Cer	DCC810171
C2213	Same as C2212	
C2214	Same as C2201	
C2215	Same as C2201	
C2216	Same as C2201	
C2217	Cap., 0.047μ, ±20%, 250V, Poly	DCF160291
C2218	Same as C2217	
C2219	Cap., 0.1μ, ±20%, 250V, Poly	DCF158021
C2220	Cap., 2~8p, Var., 250V, Cer	DCV019612
C2221	Cap., 0.5p, ±0.25p, 50V, Cer	DCC815011
C2222	Same as C2221	
C2223	Same as C2219	
C2224	Same as C2221	
C2225	Same as C2221	
C2226	Same as C2220	
C2227	Same as C2201	
C2230	Same as C2210	
C2231	Same as C2210	
C2232	Same as C2210	
C2233	Same as C2210	
C2235	Same as C2201	
C2240	Same as C2201	
R2201	Res., 4.7K, ±5%, 1/8W, Carbon	DRZ840751
R2205	Res., 100, ±20%, 0.5W, Cermet	DRV410501
R2206	Res., 56, ±1%, 1/5W, Metal	DRE999101
R2207	Res., 1K, ±5%, Thermistor	DDD080421
R2208	Res., 820, ±5%, 1/8W, Carbon	DRZ840571
R2209	Res., 1.0K, ±1%, 1/5W, Metal	DRE999251
R2210	Res., 5K, Var., 0.3W, cermet	DRV412051
R2211	Same as R2209	
R2212	Same as R2209	
R2213	Res., 1.5K, ±5%, 1/8W, Carbon	DRZ840631
R2214	Same as R2213	
R2215	Res., 18K, ±5%, 1/8W, Carbon	DRZ840891
R2216	Res., 220K, ±5%, 1/8W, Carbon	DRZ841151
R2217	Res., 6.2K, ±5%, 1/8W, Carbon	DRZ840781
R2218	Res., 1.8K, ±5%, 1/8W, Carbon	DRZ840651
R2219	Res., 560, ±5%, 1/8W, Carbon	DRZ840531
R2220	Res., 220, ±1%, 1/5W, Metal	DRE999171
R2221	Same as R2219	
R2222	Same as R2220	
R2223	Res., 680, ±5%, 1/8W, Carbon	DRZ840551
R2224	Res., 680, ±1%, 1/5W, Metal	DRE999231
R2225	Res., 500K, ±20%, 0.5W, Cermet	DRV410611
R2226	Same as R2224	
R2227	Res., 1K, Var., 0.3W, Cermet	DRV412031
R2228	Same as R2223	
R2229	Same as R2218	
R2230	Res., 4.7K, ±1%, 1/5W, Metal	DRE999331
R2231	Res., 500, Var., 0.3W, Cermet	DRV412021
R2232	Same as R2230	
R2233	Same as R2218	
R2234	Res., 120, ±5%, 1/8W, Carbon	DRZ840371
R2235	Res., 2.0K, ±1%, 1/5W, Metal	DRE999641
R2236	Same as R2235	
R2237	Same as R2234	
R2238	Res., 150K, ±5%, 1/8W, Carbon	DRZ841111
R2239	Res., 6.8K, ±5%, 1/8W, Carbon	DRZ840791
R2240	Same as R2208	
R2241	Same as R2238	
R2242	Same as R2239	
R2243	Same as R2208	
R2244	Res., 47, ±5%, 1/8W, Carbon	DRZ840271
R2247	Res., 24K, ±1%, 1/4W, Metal	DRE131161
R2248	Same as R2247	
R2249	Same as R2244	
R2250	Same as R2247	
R2251	Same as R2247	
R2254	Res., 27K, ±5%, 1/8W, Carbon	DRZ840931
R2255	Res., 10K, ±5%, 1/8W, Carbon	DRZ840831
R2256	Res., 5.6K, ±5%, 1/8W, Carbon	DRZ840771
R2257	Res., 390, ±1%, 1/5W, Metal	DRE999201
R2259	Same as R2257	
R2260	Same as R2255	
R2261	Res., 100, ±5%, 1/8W, Carbon	DRZ840351
R2262	Res., 500, Var., 0.3W, Cermet	DRV412021
R2263	Res., 4.3K, ±1%, 1/5W, Metal	DRE999521

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
R2264	Same as R2263	
R2267	Res., 7.5K, ±1%, 1/5W, Metal	DRE999821
R2268	Same as R67	
R2269	Res., 1.0K, ±5%, 1/8W, Carbon	DRZ840591
R2270	Same as R2255	
R2271	Res., 20K, Var., 0.3W, Cermet	DRV412161
R2272	Same as R2217	
R2273	Res., 1.1K, ±5%, 1/8W, Carbon	DRZ840601
R2274	Res., 750, ±5%, 1/8W, Carbon	DRZ840561
R2275	Same as R2274	
R2282	Res., 330, ±1%, 1/5W, Metal	DRE999191
R2284	Same as R2227	
R2285	Same as R2227	
D2201	Diode, 1SS184, TOS	DDD810071
D2202	Diode, 1SS226, TOS	DDD810081
D2203	Z. Diode, R06.8EB, NEC	DDD032961
Q2201	Transistor, 2SC2712, TOS	DTR830041
Q2202	Transistor, 2SA812, NEC	DTR810011
Q2203	Same as Q2202	
Q2204	Transistor, 2SA1162, TOS	DTR810031
Q2205	Transistor, 2SA1226, NEC	DTR810071
Q2206	Same as Q2205	
Q2207	Transistor, 2SC1907, NEC	DTR137611
Q2208	Same as Q2207	
Q2209	Transistor, 2SA1206, NEC	DTR115301
Q2210	Same as Q2207	
Q2211	Same as Q2207	
Q2212	Transistor, 2SA899G/B	DTR115691
Q2213	Transistor, 2SC899G/B	DTR137051
Q2214	Same as Q2213	
Q2215	Same as Q2212	
Q2216	Same as Q2201	
Q2217	Same as Q2201	
Q2220	Same as Q2204	
Q2221	Same as Q2204	
Q2222	Same as Q2204	
Q2223	Same as Q2204	
Q2224	Same as Q2204	
Q2225	Same as Q2204	
Q2226	Same as Q2204	
Q2230	Same as Q2209	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
RL2201	Relay, SY-12	DKD027301
J2201	Connector, M36-M87-02	DCN034601
J2202	Connector, M36-M87-03	DCN034611
J2203	Connector, M36-M87-04	DCN034621
J2204	Same as J2201	
P2201	Connector, M36-02-30-114P	DCN034851
P2202	Connector, M36-03-30-114P	DCN034861
P2203	Connector, M36-04-30-114P	DCN034871
P2204	Same as P2201	

SAWTOOTH OUT 23

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C2301	Cap., 1.5~5.5p, Var., 250V, Cer.	DCV019722
C2302	Cap., 22μ, ±20%, 25V, Elect.	DCE225151
C2303	Same as C2302	
C2304	Same as C2302	
C2305	Cap., 2.5~22.5p, Var., 250V, Cer.	DCV019592
L2301	Coil, K5T4-8-2	DCL152061
L2302	Same as L2301	
L2303	Same as L2301	
R2301	Res., 3.3K, ±1%, 1/5W, Metal	DRE999311
R2302	Same as R2301	
R2303	Res., 4.7K, ±5%, 1/8W, Carbon	DRZ840751
R2305	Res., 3.3K, ±5%, 1/8W, Carbon	DRZ840711
R2306	Same as R2301	
R2307	Same as R2301	
R2308	Same as R2303	
R2311	Same as R2305	
R2312	Res., 470, ±5%, 1/8W, Carbon	DRZ840511
R2313	Res., 1.8K, ±5%, 1/8W, Carbon	DRZ840651
R2314	Res., 5.1K, ±5%, 1/8W, Carbon	DRZ840761
R2316	Same as R2305	
R2317	Same as R2312	
R2318	Same as R2313	
R2319	Same as R2314	
R2322	Res., 10K, ±5%, 1/8W, Carbon	DRZ840831
R2323	Same as R2322	
R2324	Same as R2312	
R2326	Res., 1.5K, ±5%, 1/8W, Carbon	DRZ840631
R2327	Res., 3.0K, ±5%, 1/8W, Carbon	DRZ840701
R2328	Res., 100, ±5%, 1/8W, Carbon	DRZ840351
R2329	Same as R2301	
R2331	Res., 110, ±1%, 1/5W, Metal	DRE999711
R2332	Same as R2301	
R2333	Same as R2301	
R2334	Res., 15, ±1%, 1/5W, Metal	DRE999031
R2337	Same as R2314	
R2338	Res., 3.9K, ±5%, 1/8W, Carbon	DRZ840731
R2339	Res., 9.1K, ±5%, 1/8W, Carbon	DRZ840821
R2341	Same as R2339	
R2342	Same as R2312	
R2343	Same as R2312	
R2344	Res., 560, ±1%, 1/5W, Metal	DRE999221
R2346	Res., 2K, Var., 0.3W, Cermet	DRV412041
R2350	Res., 4.7K, ±1%, 1/5W, Metal	DRE999331
R2351	Same as R2350	
D2301	Diode, 1S953, NEC	DDD010051
D2302	Same as D2301	
D2303	Diode, 1SS184, TOS	DDD810071
D2303	Same as D2303	
D2306	Diode, 1SS181, TOS	DDD810061
D2307	Diode, 1SS97, NEC	DDD010451
D2308	Z. Diode, RD5.1EB, NEC	DDD030571
D2309	Diode, 1SS226, TOS	DDD810081
Q2301	Transistor, 2SC2712, TOS	DTR830041
Q2302	Same as Q2301	
Q2303	Transistor, 2SA1245MD, TOS	DTR810021
Q2304	Transistor, 2SC3120, TOS	DTR830111
Q2306	Same as Q2301	
Q2307	Transistor, 2SA1162. TOS	DTR810031
Q2308	Same as Q2304	
Q2309	Same as Q2301	
Q2310	Same as Q2307	
IC2301	IC, MC74HC04N, MOT, TOS, HIT, TEXS	DIC440051
J2301	Connector, M31-M87-12	DCN034541
J2302	Connector, M36-M87-02	DCN034601
J2303	Connector, M36-M87-06	DCN034641
P2301	Connector, M33-12-30-114P	DCN034731
P2302	Connector, M36-02-30-114P	DCN034851
P2303	Connector, M36-06-30-114P	DCN034891
	Socket contact, M31C8-4	DCN034951

EXT SIG OUT [24]

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C2401	Cap., 33p, ±5%, 50V, Cer.	DCC815211
C2403	Cap., 0.01μ, ±10%, 50V, Cer.	DCC810171
C2404	Same as C2403	
C2405	Same as C2403	
C2406	Cap., 68p, ±5%, 50V, Cer.	DCC815251
C2407	Same as C2403	
C2408	Same as C2403	
C2409	Cap., 1000p, ±10%, 500V, Cer.	DCC151801
C2410	Same as C2403	
C2411	Same as C2409	
R2401	Res., 390, ±2%, 1W, Metal	DRS221171
R2402	Same as R2401	
R2403	Same as R2401	
R2404	Same as R2401	
R2405	Res., 1.8K, ±5%, 1W, Metal	DRS220461
R2406	Res., 10K, ±5%, 1/8W, Carbon	DRZ840831
R2407	Res., 20K, ±5%, 1/8W, Carbon	DRZ840901
R2409	Res., 8.2K, ±5%, 1/8W, Carbon	DRZ840811
R2410	Res., 47, ±5%, 1/8W, Carbon	DRZ840271
R2411	Res., 2.2K, ±5%, 1/8W, Carbon	DRZ840671
R2412	Res., 0Ω	DRZ841601
R2413	Res., 4.7K, ±5%, 1/8W, Carbon	DRZ840751
R2414	Res., 510, ±5%, 1/8W, Carbon	DRZ840521
R2415	Res., 2.4K, ±5%, 1/8W, Carbon	DRZ840681
R2416	Same as R2415	
R2417	Same as R2410	
R2418	Same as R2413	
R2420	Res., 220, ±5%, 1/8W, Carbon	DRZ840431
R2421	Same as R2409	
R2422	Same as R2406	
R2423	Res., 300, ±5%, 1/8W, Carbon	DRZ840461
R2424	Res., 1.0K, ±5%, 1/8W, Carbon	DRZ840591
R2490	Res., 200K, Var., 0.3W, Cermet	DRV412141
R2491	Same as R2490	
R2492	Res., 50K, Var., 0.3W, Cermet	DRV412061
R2493	Res., 470, ±5%, 1/8W, Carbon	DRZ840511
D2401	Diode, 1SS226, TOS	DDD810081
D2402	Diode, 1SS181, TOS	
D2403	Same as D2401	
D2404	Same as D2401	
D2405	Same as D2401	
D2406	Same as D2401	
D2406	Same as D2401 TOS	
D2407	Diode, 1SS184 TOS	DDD810071
D2408	Z. Diode, RD3.3EB, NEC	DDD030651
D2409	Same as D2401	
D2410	Diode, 1SS97, NEC	DDD010451
Q2401	Transistor, SD215DE, SRI	DTR295141
Q2402	Same as Q2401	
Q2403	Transistor, 2SA1162, TOS	DTR810031
Q2404	Transistor, 2SC2712, TOS	DTR830041
Q2405	Same as Q2404	
Q2406	Same as Q2403	
Q2407	Same as Q2404	
Q2408	Same as Q2404	
IC2401	IC, CD4053BE, RCA, TOS, OKI, NEC	DIC410521
S2401	Slide switch, SLBL222C-B	DSW051001
RL2401	Relay, SY-12	DKD027301
J2401	Connector, M31-M87-08, MIT	DCN034511
J2402	Connector, M36-M87-02	DCN034601
J2404	Connector, M31-M87-15	DCN034551
J2490	Connector, M33-M87-05	DCN034581
J2491	Same as J2403	
P2401	Connector, M33-08-30-114P	
P2402	Connector, M33-12-30-114P	DCN034701
P2403	Connector, M36-02-30-114P	DCN034731
P2404	Connector, M33-15-30-114P	DCN034851
P2490	Connector, M36-05-30-114P	DCN034741
P2491	Same as P2403	DCN034881
	Socket contact, M31C8-4	DCN034951

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CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C2501	Cap., 0.01μ, ±10%, 50V, Cer.	DCC810171
C2502	Same as C2501	
C2503	Cap., 0.047μ, ±20%, 250V, Film	DCF160291
C2504	Cap., 0.1μ, ±20%, 250V, Film	DCF158021
C2505	Same as C2504	
C2506	Cap., 2~8p, Var., 250V, Cer.	DCV019561
C2507	Cap., 3p, ±0.25pF, 500V, Cer.	DCC250701
C2509	Cap., 10p, ±0.5pF, 500V, Cer.	DCC251701
C2510	Cap., 360p, ±5%, 50V, Cer.	DCC235001
C2511	Cap., 51p, ±5%, 50V, Cer.	DCC233301
C2512	Same as C2501	
C2513	Cap., 47μ, ±20%, 25V, Elect.	DCE929071
C2514	Same as C2501	
C2514	Cap., 150p, ±5%, 50V, Cer.	DCC815291
C2516	Same as C2515	
C2517	Same as C2515	
C2519	Same as C2501	
C2520	Same as C2513	
R2501	Res., 33K, ±5%, 1/8W, Carbon	DRZ840951
R2502	Res., 5.6K, ±5%, 1/8W, Carbon	DRZ840771
R2504	Res., 6.8K, ±5%, 1/8W, Carbon	DRZ840791
R2505	Res., 4.7K, ±5%, 1/8W, Carbon	DRZ840751
R2506	Res., 3.3K, ±5%, 1/8W, Carbon	DRZ840711
R2507	Res., 2.7K, ±5%, 1/8W, Carbon	DRZ840691
R2508	Res., 560, ±5%, 1/8W, Carbon	DRZ840531
R2510	Res., 2.2K, ±5%, 1/8W, Carbon	DRZ840671
R2511	Same as R2510	
R2512	Res., 100, ±5%, 1/8W, Carbon	DRZ840351
R2513	Same as R2504	
R2514	Res., 10K, ±5%, 1/8W, Carbon	DRZ840831
R2515	Res., 470, ±5%, 1/8W, Carbon	DRZ840511
R2516	Res., 2K, Var., 0.3W, Cermet	DRV412041
R2517	Same as R2512	
R2618	Same as R2510	
R2619	Same as R2510	
R2520	Res., 100, ±5%, 1/8W, Carbon	DRZ840351
R2521	Same as R2504	
R2522	Same as R2504	
R2523	Res., 1.0K, ±5%, 1/8W, Carbon	DRZ840591
R2524	Res., 4.7K, ±5%, 1/8W, Carbon	DRZ840751
R2525	Same as R2524	
R2526	Same as R2515	
R2527	Same as R2510	
R2528	Same as R2510	
R2529	Res., 680, ±5%, 1/8W, Carbon	DRZ840551
R2530	Res., 1.5K, ±5%, 1/8W, Carbon	DRZ840631
R2531	Same as R2504	
R2532	Same as R2515	
R2533	Same as R2506	
R2540	Res., 820, ±5%, 1/8W, Carbon	DRZ840571
R2541	Same as R2523	
R2542	Res., 7.5K, ±5%, 1/8W, Carbon	DRZ840801
R2543	Res., 150K, ±5%, 1/8W, Carbon	DRZ841111
R2544	Same as R2515	
R2545	Res., 22K, ±5%, 1W, Metal	DRS220591
R2547	Res., 330, ±5%, 1/8W, Carbon	DRZ840471
R2548	Res., 510, ±5%, 1/8W, Carbon	DRZ840521
R2549	Res., 820K, ±1%, 1/5W, Metal	DRE998221
R2550	Res., 18K, ±5%, 1/8W, Carbon	DRZ840891
R2551	Res., 130, ±5%, 1/8W, Carbon	DRZ840381
R2552	Res., 5.6K, ±5%, 1/5W, Metal	DRE999341
R2553	Res., 6.2K, ±1%, 1/5W, Metal	DRE999811
R2554	Same as R2553	
R2555	Same as R2553	
R2560	Same as R2523	
R2560	Res., 1K, Var., 0.3W, Cermet	DRV412031
R2562	Same as R2520	
D2502	Diode, 1SS184, TOS	DDD810071
D2503	Diode, SM-05-20FRZ, ORI.	DDD021721
D2504	Same as D2502	
Q2501	Transistor, 2SC2712, TOS	DTR830041
Q2502	Same as Q2501	
Q2503	Transistor, 2SC1621, NEC	DTR838021
Q2504	Transistor, 2SA1162, TOS	DTR810031
Q2505	Same as Q2501	
Q2506	Same as Q2503	
Q2507	Same as Q2501	
Q2508	Same as Q2501	
Q2509	Same as Q2501	
Q2513	Same as Q2504	
Q2514	Same as Q2501	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.	CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
Q2515	Transistor, 2SA899G/B, FUJ	DTR115691			
Q2516	Transistor, 2SC1904G/B, FUJ	DTR137051			
IC2501	IC, SN74LS04N, TEXS, HIT	DIC140051			
J2502	Connector, M31-M87-12	DCN034541			
J2503	Connector, M36-M87-04	DCN034621			
J2504	Connector, M36-M87-02	DCN034601			
P2502	Connector, M33-12-30-114P	DCN034731			
P2503	Connector, M36-04-30-134P	DCN034921			
P2505	Connector, M36-02-30-114P	DCN034851			

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CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C2601	Cap., 1μ, −10~100%, 250V, Elect.	DCE270251
C2602	Cap., 0.1μ, ±20%, 250V, Film	DCF158021
C2603	Cap., 0.01μ, 80~−20%, 3KV, Cer.	DCC173501
C2604	Cap., 1000p, ±20%, 3KV, Cer.	DCC171831
C2605	Cap., 0.01μ, ±20%, 630V, Film	DCF170201
C2606	Cap., 0.047μ, ±20%, 630V, Film	DCF171131
C2607	Cap., 22μ, ±22%, 25V, Elect.	DCE225151
C2608	Cap., 4.7μ, ±20%, 50V, Elect.	DCE245051
C2609	Cap., 47p, ±5%, 50V, Cer.	DCC815231
C2610	Cap., 0.033μ, ±10%, 50V, Film	DCF120091
C2611	Cap., 0.1μ, ±10%, 50V, Film	DCF129601
C2612	Same as C2604	
C2613	Cap., 0.22μ, ±10%, 50V, Film	DCF129711
C2614	Same as C2603	
C2615	Same as C2603	
C2616	Cap., 1μ, ±30%, 50V, Elect.	DCE144521
C2617	Cap., 0.01μ, ±10%, 50V, Cer.	DCC810171
C2618	Cap., 10p, ±0.5pF, 50V, Cer.	DCC815151
C2619	Cap., 0.01μ, 80~−20%, 500V, Cer.	DCC153511
C2620	Cap., 1000p, ±10%, 500V, Cer.	DCC151801
C2621	Same as C2620	
C2622	Cap., 100μ, ±20%, 25V, Elect	DCE225181
R2601	Res., 5.6K, ±5%, 1/8W, Carbon	DRZ840771
R2602	Res., 50K, Var., 0.3W, Cermet	DRV412061
R2603	Res., 200K, Var., 0.3W, Cermet	DRV412141
R2605	Res., 22K, ±1%, 1/2W, Metal	DRE141151
R2606	Res., 1.0, ±5%, 1/8W, Carbon	DRZ840111
R2607	Res., 100K, ±20%, 0.5W, Cermet	DRV420231
R2608	Res., 430K, ±1%, 1/2W, Metal	DRE141461
R2609	Same as R2608	
R2610	Res., 910K, ±1%, 1/2W, Metal	DRE141541
R2611	Same as R2610	
R2612	Res., 10K, ±1%, 1/4W, Metal	DRE131071
R2613	Res., 10M, ±5%, 1W, Metal	DRG940321
D2614	Res., 470K, ±5%, 1/8W, Carbon	DRZ840111
R2615	Same as R2614	
R2616	Same as R2614	
R2617	Same as R2614	
R2618	Same as R2614	
R2619	Same as R2614	
R2620	Res., 2.2M, ±5%, 1W, Metal	DRG940311
R2621	Res., 33K, ±5%, 1/8W, Carbon	DRZ840951
R2622	Res., 82K, ±5%, 1/8W, Carbon	DRZ841051
R2623	Same as R2622	
R2624	Same as R2601	
R2625	Res., 39K, ±5%, 1/8W, Carbon	DRZ840971
R2626	Res., 200K, ±20%, 0.5W, Cermet	DRV410601
R2627	Res., 180K, ±1%, 1/5W, Metal	DRE998061
R2628	Same as R2621	
R2629	Res., 220K, ±1%, 1/5W, Metal	DRE998081
R2630	Res., 3.9K, ±1%, 1/5W, Metal	DRE999321
R2631	Same as R2629	
R2632	Res., 2.2K, ±5%, 1/8W, Carbon	DRZ840671
R2633	Res., 1.8K, ±5%, 1/8W, Carbon	DRZ840651
R2634	Res., 18K, ±5%, 1/8W, Carbon	DRZ840891
R2635	Same as R2622	
R2636	Res., 180, ±5%, 1/8W, Carbon	DRZ840411
R2637	Res., 15M, ±5%, 2W, Metal	DRG950121
R2638	Same as R2606	
R2640	Same as R2606	
R2641	Res., 10K, ±1%, 1/5W, Metal	DRE999371
R2645	Res., 100K, ±5%, 1/8W, Carbon	DRZ841071
R2646	Res., 4.7K, ±5%, 1/8W, Carbon	DRZ840751
R2647	Res., 2.7K, ±5%, 1/8W, Carbon	DRZ840691
R2648	Res., 15K, ±5%, 1/8W, Carbon	DRZ840751
R2649	Res., 10, ±5%, 1/8W, Carbon	DRZ840111
D2601	Diode, SM-05-20FRZ, ORI.	DDD021721
D2602	Same as D2601	
D2603	Same as D2601	
D2604	Same as D2601	
D2605	Diode, 1SS184, TOS.	DDD810071
D2606	Same as D2605	
D2607	Same as D2605	
D2608	Same as D2605	
D2610	Same as D2605	
Q2601	Transistor, 2SC1904G/B, FUJ.	DTR137051
Q2602	Transistor, 2SC2712, TOS.	DTR830041
Q2603	Transistor, 2SA1162, TOS.	DTR810031

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.	CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
Q2604	Same as Q2602				
IC2601	IC, μPC251C, NEC.	DIC610091			
J2601	Connector, M36-M87-02	DCN034601			
J2602	Same as J2601				
J2603	Same as J2601				
J2604	Connector, M31-M87-12	DCN034541			
J2605	Connector, M31-M87-10	DCN034531			
P2601	Connector, M36-02-30-114P	DCN034851			
P2602	Same as P2601				
P2603	Same as P2601				
P2604	Connector, M33-12-30-114P	DCN034731			
P2605	Connector, M33-10-30-114P	DCN034721			
V2602	Neon Bracket Lamp, NL-235	DLP025171			
	Socket Contact, M31C8-4	DCN034951			

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CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C2750	Cap., 47μ, ±20%, 100V, Elect.	DCE255091
C2751	Cap., 0.047μ, ±20%, 630V, Film	DCF171131
C2752	Cap., 0.01μ, 80~−20%, 3KV, Cer.	DCC173501
C2753	Cap., 1000p, ±20%, 3KV, Cer.	DCC171831
C2754	Cap., 100p, ±10%, 500V, Cer.	DCC254001
C2755	Same as C2752	
L2701	Inductor, Lotation Coil	DCL140111
L2702	Inductor, Orthogonality Coil	DCL140251
R2750	Res., 220K, ±5%, 1/4W, Carbon	DRD139791
R2751	Same as R2750	
R2752	Res., 330, ±5%, 1/8W, Carbon	DRZ840471
R2753	Res., 100K, ±5%, 1/8W, Carbon	DRZ841071
R2754	Res., 1, ±5%, 1/4W, Carbon	DRD138611
D2750	Diode, 1SS185, TOS.	DDD810071
D2751	Diode, SM-05-20FRZ, ORI.	DDD021721
D2752	Same as D2751	
D2753	Same as D2751	
D2754	Diode, SHV-20, SAN	DDD021441
Q2701	Transistor, 2SC2334L, NEC	DTR137621
J2750	Connector, M31-M87-12	DCN034541
J2751	Connector, M36-M87-02	DCN034601
J2752	Same as J2751	
J2753	Same as J2751	
J2754	Connector with 3P lead wire.	KHB041511
P2750	Connector, M33-12-30-114P	DCN034731
P2751	Connector, M36-02-30-114P	DCN034851
P2752	Same as P2751	
P2753	Same as P2751	
T2750	High Voltage Transformer, FS-34442	DCL220351
U2701	High Voltage Unit, MSL3587A	DES050563
V2701	Braun tube, S-82121B31	DET016071
	Braun tube socket, S0-K2(A)	DSK010181

VR CIRCUIT 28

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C2801	Cap., 100μ, ±20%, 25V, Elect.	DCE225181
C2802	Cap., 473p, ±10%, 50V, Cer.	DCC810251
C2803	Cap., 1μ, ±20%, 50V, Elect.	DCE245021
C2804	Cap., 0.01μ, ±10%, 50V, Cer.	DCC810171
C2805	Same as C2804	
C2806	Same as C2803	
C2807	Same as C2803	
C2808	Same as C2804	
C2809	Cap., 22μ, ±20%, 25V, Elect.	DCE225151
C2810	Cap., 0.01μ, +100~0%, 500V, Cer.	DCC153511
C2811	Same as C2810	
C2812	Same as C2804	
C2813	Same as C2802	
R2801	Res., 2.2, ±5%, 1/4W, Carbon	DRD134191
R2802	Res., 4.7K, ±5%, 1/8W, Carbon	DRZ840751
R2803	Res., 6.8K, ±5%, 1/8W, Carbon	DRZ840791
R2804	Same as R2802	
R2805	Same as R2802	
R2806	Res., 500, Var., 0.3W, Cermet	DRV412021
R2807	Res., 820, ±5%, 1/8W, Carbon	DRZ840571
R2808	Res., 1.0K, ±5%, 1/8W, Carbon	DRZ840591
R2809	Res., 120, ±5%, 1/8W, Carbon	DRZ840371
R2810	Res., 10K, ±5%, 1/8W, Carbon	DRZ840831
R2811	Res., 100, ±5%, 1/8W, Carbon	DRZ840351
R2812	Same as R2810	
R2813	Same as R2808	
R2814	Same as R2808	
R2815	Res., 47K, ±5%, 1/8W, Carbon	DRZ840991
R2816	Same as R2815	
R2817	Same as R2815	
R2818	Same as R2807	
R2819	Res., 15K, ±5%, 1/8W, Carbon	DRZ840871
R2820	Res., (50K, 50K), Var., 0.1W, Carbon with switch	DRV147391
R2821	Res., 330, ±5%, 1/8W, Carbon	DRZ840471
R2822	Same as R2819	
R2824	Res., 200K, Var., 0.2W, Carbon	DRV146851
R2825	Same as R2815	
R2826	Res., 75K, ±5%, 1/8W, Carbon	DRZ841041
R2827	Res., 200K, Var., 0.5W, Cermet	DRV350211

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
R2828	Res., 62K, ±5%, 1/8W, Carbon	DRE999871
R2829	Res., 50K, Var., 0.2W, Carbon	DRV146961
R2830	Res., 470, ±5%, 1/8W, Carbon	DRZ840511
R2831	Res., 9.1, ±5%, 2W, Metal	DRS231371
R2832	Res., 50, Var., 0.5W, Cermet	DRV350202
R2833	Res., 1.2K, ±5%, 1/8W, Carbon	DRZ840611
R2834	Same as R2815	
R2835	Same as R2828	
R2836	Same as R2826	
R2837	Same as R2821	
R2838	Same as R2802	
R2839	Res., 2.2K, ±5%, 1/8W, Carbon	DRZ840671
R2840	Res., 5.6K, ±5%, 1/8W, Carbon	DRZ840771
R2841	Same as R2810	
R2842	Res., 3.3K, ±5%, 1/8W, Carbon	DRZ840711
R2843	Res., 3.9K, ±5%, 1/8W, Carbon	DRZ840731
R2844	Res., 1.8K, ±5%, 1/8W, Carbon	DRZ840651
R2845	Same as R2839	
R2846	Same as R2809	
R2860	Same as R2815	
D2801	Diode, 1SS184, TOS	DDD810071
D2802	Diode, 1SS181, TOS	DDD810061
D2803	L.E.D., TLR206	DDD070181
D2804	L.E.D., TLG104	DDD071111
D2805	Same as D2802	
Q2801	Transistor, 2SA1162, TOS	DTR810031
Q2802	Transistor, 2SC2712, TOS	DTR830041
Q2803	Same as Q2802	
Q2804	Same as Q2802	
Q2805	Same as Q2801	
Q2806	Same as Q2801	
Q2807	Same as Q2801	
Q2808	Same as Q2801	
Q2809	Same as Q2802	
IC01	IC, SN74LS74AN, TEXS, HIT	DIC140751
IC02	IC, SN74LS08N, TEXS, HIT	DIC140091
S2802	Push switch, SUJ12A	DSN014841
J2801	Connector, M36-M87-03	DCN034611
J2802	Connector, ZC-012	DCN032661
J2803	Connector, M36-M87-02	DCN034601
J2804	Connector, M36-M87-06	DCN034641
J2805	Same as J2803	
J2806	Connector, M36-M87-05	DCN034631
J2807	Same as J2803	
J2808	Same as J2803	
P2801	Connector, M36-03-30-114P	DCN034861
P2802	Connector,	KHB070611
P2803	Connector, M36-02-30-114P	DCN034851
P2804	Connector, M36-06-30-114P	DCN034891
P2805	Same as P2803	
P2806	Connector, M36-05-30-114P	DCN034881
P2807	Same as P2803	
P2808	Same as P2803	
PL2801	Scale Illumination Lamp	DLP016092
PL2802	Same as PL2801	
PL2803	Same as PL2801	
TP2801	CAL Terminal	DTA010871
TP2802	8ϕ Earth Terminal	DTA020501
TP2803	CP output Terminal	KAS056311
TP2804	Earth Terminal	KPS009511

A/D CONVERTER [40]

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C4001	Cap., 10μ, ±20%, 25V, Elect tan	DSC461301
C4002	Same as C4001	
C4003	Cap., 22μ, ±20%, 10V, Elect tan	DSC439041
C4004	Same as C4003	
C4005	Cap., 100p, ±20%, 10V, Elect	DCE219021
C4006	Cap., 0.01μ,+80~20%, 50V, Cer	DCC810511
C4007	Cap., 1000p, ±5%, 50V, Cer	DCC815861
C4008	Same as C4006	
C4009	Same as C4007	
C4010	Same as C4006	
C4011	Same as C4007	
C4012	Same as C4006	
C4013	Same as C4007	
C4014	Same as C4007	
C4015	Same as C4006	
C4016	Same as C4007	
C4017	Same as C4007	
C4018	Same as C4006	
C4020	Same as C4005	
C4021	Cap., 100p, ±5%, 50V, Cer	DCC815741
C4022	Same as C4021	
C4023	Cap., 220μ, ±20%, 10V, Elect	DCE219061
C4024	Same as C4023	
C4025	Same as C4023	
C40101	Same as C4006	
C40102	Same as C4006	
C40103	Same as C4007	
C40105	Same as C4006	
C40106	Same as C4006	
C40107	Same as C4007	
C40108	Same as C4006	
C40110	Cap., 20p, ±5%, 200V, Cer	DCC819231
C40111	Cap., 12p, ±0.5pF, 200V, cer	DCC815561
C40112	Same as C4006	
C40117	Same as C4006	
C40123	Cap., 0.047μ, +80~-20%, 50V, Cer	DCC810551
C40124	Same as C4006	
C40125	Same as C4006	
C40126	Same as C4006	
C40130	Same as C4007	
C40131	Same as C4006	
C40132	Same as C4007	
C40133	Same as C4006	
C40134	Same as C4007	
C40135	Same as C4006	
C40136	Same as C4007	
C40137	Same as C4006	
C40138	Same as C4006	
C40139	Same as C4007	
C40140	Cap., 1p, ±0.25pF, 50V, Cer	DCC815521
C40141	Cap., 47p, ±20%, 10V, Elect	DCE219011
C40142	Same as C4001	
C40143	Same as C4006	
C40144	Cap., 1.3~3.0p, Var., 250, Cer	DCV019672
C40150	Same as C4007	
C40151	Same as C4006	
C40152	Same as C4006	
C40160	Same as C4006	
C40201	Same as C4007	
C40202	Same as C4006	
C40203	Same as C4006	
C40205	Cap., 12p, ±5%, 200V, Cer	DCC819221
C40206	Same as C40205	
C40207	Cap., 6p, ±0.5F, 200V, Cer	DCC819201
C40208	Same as C4007	
C40209	Same as CC4006	
C40210	Same as C4006	
C40211	Same as C4007	
C40212	Cap., 220p, ±5%, 100V, Cer	DCC819241
C40213	Same as C40212	
C40214	Same as C4006	
C40215	Same as C4007	
C40216	Same as C4021	
C40217	Same as C4007	
C40218	Same as C4006	
C40219	Same as C40212	
C40220	Same as C40212	
C40221	Same as C40212	
C40222	Same as C4006	
C40223	Same as C4007	
C40224	Same as C4007	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C40225	Same as C4006	
C40226	Same as C4006	
C40227	Same as C4006	
C40240	Same as C40207	
C40301	Same as C4006	
C40302	Same as C4006	
C40306	Same as C4006	
C40307	Same as C4007	
C40308	Same as C4006	
C40310	Same as C40110	
C40311	Same as C40111	
C40312	Same as C4006	
C40316	Same as C4006	
C40317	Same as C4006	
C40323	Same as C40123	
C40324	Same as C4006	
C40325	Same as C4006	
C40326	Same as C4006	
C40328	Same as C4007	
C40329	Same as C4006	
C40330	Same as C4007	
C40331	Same as C4006	
C40332	Same as C4007	
C40333	Same as C4006	
C40334	Same as C4007	
C40335	Same as C4006	
C40336	Same as C4007	
C40337	Same as C4006	
C40338	Same as C4006	
C40339	Same as C4007	
C40341	Same as C40141	
C40342	Same as C4001	
C40343	Same as C4006	
C40350	Same as C4006	
C40351	Same as C4006	
C40352	Same as C4006	
C40401	Same as C4007	
C40402	Same as C4006	
C40403	Same as C4006	
C40404	Same as C40207	
C40405	Same as C40205	
C40406	Same as C40205	
C40407	Same as C40207	
C40408	Same as C4007	
C40409	Same as C4006	
C40410	Same as C4006	
C40411	Same as C4007	
C40412	Same as C40212	
C40413	Same as C40212	
C40414	Same as C4006	
C40415	Same as C4007	
C40416	Same as C4021	
C40417	Same as C4007	
C40418	Same as C4006	
C40419	Same as C40212	
C40420	Same as C40212	
C40421	Same as C40212	
C40422	Same as C4006	
C40423	Same as C4007	
C40424	Same as C4007	
C40425	Same as C4006	
C40426	Same as C4006	
C40427	Same as C4006	
C40501	Same as C4006	
C40502	Same as C4006	
C40503	Same as C4007	
C40504	Same as C4006	
C40505	Same as C4007	
C40506	Same as C4021	
C40507	Cap., 150p, ±5%, 50V, Cer	DCC815761
C40508	Same as C40507	
C40509	Same as C4021	
C40510	Same as C4006	
C40511	Same as C4006	
C40512	Same as C4007	
C40513	Same as C4006	
C40514	Same as C4007	
C40516	Same as C40123	
C40517	Same as C4006	
C40518	Same as C4006	
C40519	Same as C4006	
C40520	Same as C4006	
C40601	Cap., 0.01μ, +80~-20%, 50V, Cer	
C40602	Same as C40601	
C40603	Cap., 56p, ±5%, 50V, Cer	DCC815241
C40604	Cap., 470p, ±5%, 50V, Cer	DCC815351

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C40605	Same as C40604	
L4001	Coil, K5T1-8-2	DCL152061
L4002	Same as L4001	
L4003	Same as L4001	
L4004	Same as L4001	
L4005	Same as L4001	
L40201	High Frequency coil L-32N	DCL152051
L40202	Same as L40201	
L40203	Same as L40201	
L40401	Same as L40201	
L40402	Same as L40201	
L40403	Same as L40201	
R4001	Res., 1K, ±5%, 0.1W, Carbon	DRZ830211
R4002	Res., 2K, ±5%, 0.1W, Carbon	DRZ830211
R4003	Res., 3K, ±5%, 0.1W, Carbon	DRZ830311
R4004	Res., 270, ±5%, 0.1W, Carbon	DRZ830181
R4005	Res., 160, ±5%, 0.1W, Carbon	DRZ830481
R4006	Same as R4004	
R4007	Same as R4005	
R4008	Same as R4004	
R4009	Same as R4005	
R4010	Same as R4004	
R4011	Same as R4005	
R4012	Same as R4004	
R4013	Same as R4005	
R4014	Same as R4004	
R4015	Same as R4005	
R4016	Same as R4004	
R4017	Same as R4005	
R4018	Same as R4004	
R4019	Same as R4005	
R4020	Same as R4004	
R4021	Same as R4005	
R4022	Same as R4004	
R4023	Same as R4005	
R4024	Same as R4004	
R4025	Same as R4005	
R4026	Same as R4004	
R4027	Same as R4005	
R4028	Same as R4004	
R4029	Same as R4005	
R4030	Same as R4004	
R4031	Same as R4005	
R40102	Res., 56, ±5%, 0.1W, Carbon	DRZ830251
R40103	Res., 681, ±5%, 0.1W, Carbon	DRZ830591
R40105	Res., 100, ±5%, 0.1W, Carbon	DRZ830261
R40108	Res., 560, ±5%, 0.1W, Carbon	DRZ830571
R40109	Same as R40108	
R40110	Res., 150, ±5%, 0.1W, Carbon	DRZ830171
R40111	Same as R4001	
R40112	Same as R4001	
R40113	Res., 620, ±1%, 1/8W, Metal	DRE520581
R40114	Same as R40113	
R40115	Same as R4001	
R40116	Res., 47, ±5%, 0.1W, Carbon	DRZ830241
R40117	Res., 1.2K, ±5%, 0.1W, Carbon	DRZ830641
R40118	Res., 27, ±5%, 0.1W, Carbon	DRZ830441
R40119	Res., 360, ±5%, 0.1W, Carbon	DRZ830541
R40120	Same as R40119	
R40121	Res., 33, ±5%, 0.1W, Carbon	DRZ830231
R40122	Same as R4004	
R40123	Res., 820K, ±5%, 0.1W, Carbon	DRZ830771
R40124	Same as R40116	
R40125	Same as R40116	
R40126	Same as R40116	
R40127	Res., 750, ±5%, 0.1W, Carbon	DRZ830601
R40128	Res., 1.3K, ±5%, 0.1W, Carbon	DRZ830281
R40129	Res., 200, ±5%, 0.1W, Carbon	DRZ830501
R40130	Res., 220, ±1%, 1/8W, Metal	DRE520751
R40131	Res., 6.8K, ±5%, 0.1W, Carbon	DRZ830221
R40132	Res., 560, ±1%, 1/8W, Metal	DRE520571
R40133	Res., 1K, ±1%, 1/8W, Metal	DRE520811
R40134	Res., 2.4K, ±5%, 0.1W, Carbon	DRZ830681
R40135	Res., 1K, Var., 0.5W, Cermet	DRV410531
R40136	Res., 470, ±1%, 1/8W, Metal	DRE520711
R40137	Res., 68, ±5%, 0.1W, Carbon	DRZ830451
R40138	Res., 1.5K, ±5%, 0.1W, Carbon	DRZ830651
R40139	Same as R40103	
R40140	Res., 50, Var., 0.5W, Cermet	DRV410491
R40141	Res., 2.4K, ±1%, 1/8W, Metal	DRE520331
R40142	Same as R40135	
R40143	Res., 15K, ±1%, 1/8W, Metal	DRE520851
R40144	Same as R40143	
R40145	Same as R4001	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
R40146	Same as R40117	
R40147	Same as R4001	
R40148	Res., 2.4K, ±5%, 0.1W, Carbon	DRZ830681
R40150	Res., 1.6K, ±1%, 1/8W, Metal	DRE520591
R40151	Same as R40136	
R40152	Res., 560, ±5%, 0.1W, Carbon	DRZ830571
R40201	Res., 240, ±5%, 0.1W, Carbon	DRZ830521
R40202	Same as R40201	
R40203	Res., 82, ±5%, 0.1W, Carbon	DRZ830461
R40204	Res., 180, ±5%, 0.1W, Carbon	DRZ830491
R40205	Res., 470, ±5%, 0.1W, Carbon	DRZ830201
R40206	Same as R40116	
R40207	Same as R40116	
R40208	Same as R40138	
R40209	Same as R40205	
R40210	Same as R40201	
R40211	Same as R40203	
R40212	Same as R40201	
R40213	Same as R40201	
R40214	Same as R40203	
R40215	Same as R40119	
R40216	Same as R40119	
R40217	Same as R40116	
R40218	Same as R40203	
R40219	Same as R40201	
R40220	Same as R40201	
R40221	Same as R40138	
R40223	Same as R40205	
R40224	Same as R40118	
R40225	Same as R40103	
R40226	Same as R40103	
R40227	Same as R40103	
R40228	Same as R4001	
R40229	Same as R40204	
R40230	Same as R40138	
R40231	Same as R40138	
R40232	Same as R40105	
R40233	Same as R40131	
R40234	Same as R40103	
R40236	Res., 10, ±5%, 0.1W, Carbon	DRZ830111
R40237	Same as R4001	
R40238	Same as R4001	
R40240	Same as R40201	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
R40302	Same as R40116	
R40303	Same as R4004	
R40304	Same as R40135	
R40305	Same as R40105	
R40308	Same as R40108	
R40309	Same as R40108	
R40310	Same as R40110	
R40311	Same as R4001	
R40312	Same as R4001	
R40313	Same as R40113	
R40314	Same as R40113	
R40315	Same as R4001	
R40316	Same as R40116	
R40317	Same as R40117	
R40318	Same as R40118	
R40319	Same as R40119	
R40320	Same as R40119	
R40321	Same as R40121	
R40322	Same as R4004	
R40323	Same as R40123	
R40324	Same as R40116	
R40325	Same as R40116	
R40326	Same as R40116	
R40327	Same as R40127	
R40328	Same as R40128	
R40329	Same as R40129	
R40330	Same as R40130	
R40331	Same as R40131	
R40332	Same as R40132	
R40333	Same as R40133	
R40334	Same as R40134	
R40335	Same as R40135	
R40336	Same as R40136	
R40337	Same as R40137	
R40338	Same as R40138	
R40339	Same as R40103	
R40340	Same as R40140	
R40341	Same as R40141	
R40342	Same as R40135	
R40343	Same as R40143	
R40344	Same as R40143	
R40345	Same as R4001	
R40346	Same as R40117	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
R40347	Same as R4001	
R40348	Same as R40148	
R40350	Same as R40150	
R40351	Same as R40136	
R40352	Same as R40152	
R40401	Same as R40201	
R40402	Same as R40201	
R40403	Same as R40203	
R40404	Same as R40204	
R40405	Same as R40205	
R40406	Same as R40116	
R40407	Same as R40116	
R40408	Same as R40138	
R40409	Same as R40205	
R40410	Same as R40201	
R40411	Same as R40203	
R40412	Same as R40201	
R40413	Same as R40201	
R40414	Same as R40203	
R40415	Same as R40119	
R40416	Same as R40119	
R40417	Same as R40116	
R40418	Same as R40203	
R40419	Same as R40201	
R40420	Same as R40201	
R40421	Same as R40138	
R40423	Same as R40205	
R40424	Same as R40118	
R40425	Same as R40103	
R40426	Same as R40103	
R40427	Same as R40103	
R40428	Same as R4001	
R40429	Same as R40204	
R40430	Same as R40138	
R40431	Same as R40138	
R40432	Same as RR40105	
R40433	Same as R40131	
R40434	Same as R40103	
R40436	Same as R40236	
R40437	Same as R4001	
R40438	Same as R4001	
R40440	Same as R40201	
R40501	Same as R40103	
R40502	Same as R40152	
R40503	Res., 330, ±1%, 1/8W, Metal	DRE520531
R40504	Res., 500, Var., 0.5W, Cermet	DRV410521
R40505	Same as R40136	
R40506	Same as R40304	
R40507	Res., 270, ±5%, 0.1W, Carbon	DRZ830181
R40508	Same as R40507	
R40509	Res., 10K, ±1%, 1/8W, Metal	DRE520631
R40510	Same as R40509	
R40511	Res., 12K, ±1%, 1/8W, Metal	DRE520841
R40512	Res., 12K, ±5%, 0.1W, Carbon	DRZ830721
R40513	Res., 20K, ±5%, 0.1W, Carbon	DRZ830751
R40514	Same as R4002	
R40515	Same as R4001	
R40516	Res., 1.6K, ±1%, 1/8W, Metal	DRE520591
R40517	Same as R40504	
R40601	Res., 8.2K, ±5%, 1/8W, Carbon	DRZ840811
R40602	Res., 910, ±5%, 1/8W, Carbon	DRZ840581
R40604	Res., 150, ±5%, 1/8W, Carbon	DRZ840391
R40605	Res., 240, ±1%, 1/5W, Metal	DRE999601
RA40101	Resistor array, 8-3.3KJ	DFB016351
RA40102	Resistor array, 804.7KJ	DFB015791
RA40301	Same as RA40101	
RA40302	Same as RA40102	
D40101	Diode, 1SS226, TOS	DDD810081
D40102	Diode, 1SS97, NEC	DDD010451
D40103	Same as D40102	
D40104	Same as D40102	
D40105	Same as D40102	
D40106	Z. Diode, RD6.8EB1, NEC	DDD034941
D40107	Z. Diode, RD4.7EB, NEC	DDD031771
D40109	Same as D40102	
D40110	Same as D40102	
D40201	Diode, 1S953, NEC	DDD010051
D40202	Same as D40102	
D40203	Same as D40102	
D40204	Same as D40102	
D40205	Same as D40102	
D40206	Same as D40102	
D40207	Same as D40102	
D40301	Same as D40101	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
D40302	Same as D40102	
D40303	Same as D40102	
D40304	Same as D40102	
D40305	Same as D40102	
D40306	Same as D40106	
D40307	Same as D40107	
D40309	Same as D40102	
D40310	Same as D40102	
D40401	Same as D40201	
D40402	Same as D40102	
D40403	Same as D40102	
D40404	Same as D40102	
D40405	Same as D40102	
D40406	Same as D40102	
D40407	Same as D40102	
D40501	Diode, 1SS99, NEC	DDD010461
D40502	Same as D40501	
Q40101	Transistor, 2SC3356, NEC	DTR830071
Q40102	Transistor, 2SC2712, TOS	DTR830041
Q40103	Same as Q40101	
Q40104	Same as Q40101	
Q40105	Transistor, 2SA1245MD, TOS	DTR810021
Q40106	2SC2408, NEC	DTR135601
Q40107	Transistor, 2SK211-Y, TOS	DTR860041
Q40108	Same as Q40107	
Q40109	Same as Q40101	
Q40110	Same as Q40101	
Q40111	Same as Q40101	
Q40112	Same as Q40102	
Q40113	Same as Q40101	
Q40114	Transistor, 2SA1015Y, TOS	DTR116111
Q40115	Same as Q40105	
Q40116	Same as Q40114	
Q40201	Same as Q40101	
Q40202	Same as Q40101	
Q40203	Same as Q40101	
Q40204	Same as Q40101	
Q40205	Same as Q40101	
Q40206	Same as Q40101	
Q40207	Same as Q40101	
Q40208	Same as Q40101	
Q40209	Same as Q40101	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
Q40210	Transistor, 2SC1621, NEC	DTR838021
Q40211	Transistor, 2SC1253, NEC	DTR136841
Q40301	Same as Q40101	
Q40302	Same as Q40102	
Q40303	Same as Q40101	
Q40304	Same as Q40101	
Q40305	Same as Q40105	
Q40306	Same as Q40106	
Q40307	Same as Q40107	
Q40308	Same as Q40107	
Q40309	Same as Q40101	
Q40310	Same as Q40101	
Q40311	Same as Q40101	
Q40312	Same as Q40102	
Q40313	Same as Q40101	
Q40314	Same as Q40114	
Q40315	Same as Q40105	
Q40316	Same as Q40114	
Q40401	Same as Q40101	
Q40402	Same as Q40101	
Q40403	Same as Q40101	
Q40404	Same as Q40101	
Q40405	Same as Q40101	
Q40406	Same as Q40101	
Q40407	Same as Q40101	
Q40408	Same as Q40101	
Q40409	Same as Q40101	
Q40410	Same as Q40210	
Q40411	Same as Q40211	
Q40601	Transistor, SD215DE, CIR	DTR295141
Q40602	Same as Q40601	
Q40603	Same as Q40601	
Q40604	Same as Q40601	
IC4001	IC, MC10H158L, MOT	DIC322261
IC4002	IC, MC10H131L, MOT	DIC322241
IC4003	IC, MC10H116L, MOT	DIC322231
IC4004	Same as IC4003	
IC4005	IC, F10125DC, FC, MOT, HIT	DIC310071
IC40101	IC, CX20052A, SONY	DIC641841
IC40102	Same as IC4005	
IC40103	Same as IC4005	
IC40104	IC, SN74ALS374N, TEXS	DIC192321

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
IC40105	IC, μPC151C, NEC	DIC610021
IC40301	Same as IC40101	
IC40302	Same as IC4005	
IC40303	Same as IC4005	
IC40304	Same as IC40104	
IC40305	Same as IC40105	
IC40501	IC, μPC648C, NEC	DIC641851
IC40502	Same as IC40105	
IC40503	IC, AM685DL, AMD	DIC630721
IC40504	IC, SN74LS193N, TEXS, HIT	DIC141801
IC40505	Same as IC40504	
IC40506	Same as IC40504	
IC40507	IC, SN74LS74AN, TEXS, HIT	DIC140751
IC40508	IC, SN74LS22IN, TEXS, HIT	DIC142071
IC40509	IC, 74F00PC, FC	DIC198031
IC40510	Same as IC4005	
IC40601	IC, μPC251C, NEC	DIC610091
J40501	Connector, M36-M87-02	DCN034601
J40601	Same as J40501	
J40602	Same as J40501	
J40603	Same as J40501	
P4003	Connector, 00-8272-264-000-162	DCN991121
P4004	Connector, M36-03-30-114P	DCN034861
P40501	Connector, M36-02-30-134P	DCN034901
P40601	Same as P40501	
P40602	Same as P40501	
P40603	Same as P40501	
P40604	Connector, 65507-136	DCN033501
P40605	Same as P40604	
T40201	Coil, K5T3-6-1.5	DCL152021
T40202	Coil, K5T5-10-25	DCL152031
T40401	Same as T40201	
T40402	Same as T40202	
DL4001	Delay cable, SIL20N101	DZB990221
DL4002	Same as DL4001	
DL4003	Same as DL4001	
DL4003	Same as DL4001	
DL4004	Same as DL4001	
DL4005	Same as DL4001	
DL4006	Same as DL4001	

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CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C4101	Cap., 0.01μ, −20~+80%, 50V, Cer.	DCC139511
C4102	Same as C4101	
C4103	Same as C4101	
C4104	Same as C4101	
C4105	Cap., 15P, ±5%, 50V, Cer.	DCC239011
C4106	Same as C4101	
C4107	Cap., 10P, ±0.5pF, 50V, Cer.	DCC239041
C4131	Cap., 56P, ±5%, 100V, Mica	DCM242921
C4132	Same as C4101	
C4150	Same as C4101	
C4161	Cap., 4700P, ±5%, 50V, film	DCF128271
C4163	Same as C4101	
C4170	Cap., 820P, ±5%, 50V, Cer.	DCC239141
C4180	Cap., 0.1μ, −20~+80%, 50V, Cer.	DCC137091
C41101	Same as C4101	
C41102	Same as C4101	
C41103	Same as C4101	
C41107	Same as C4107	
C41131	Same as C4131	
C41132	Same as C4101	
C41150	Same as C4101	
C41161	Same as C4161	
C41163	Same as C4101	
C41166	Cap., 33pF, ±5%, 50V, Cer.	DCC239011
C41180	Same as C4180	
C41201	Same as C4101	
C41205	Cap., 1000P, ±5%, 50V, film	DCF129251
C41206	Same as C41205	
C41207	Same as C41166	
C41241	Cap., 100P, ±5%, 50V, Cer.	DCC239051
C41242	Same as C41241	
C41247	Cap., 47P, ±5%, 50V, Cer.	DCC239031
C41248	Same as C41247	
C41301	Same as C4101	
C41302	Same as C4101	
C41303	Same as C4101	
C41304	Same as C4101	
C41305	Same as C4180	
C41306	Same as C4180	
C41307	Same as C4180	
C41308	Same as C4180	
C41309	Same as C4101	
C41310	Same as C4101	
C41311	Same as C4101	
C41312	Same as C4101	
C41313	Same as C4101	
C41314	Same as C4101	
C41315	Same as C4101	
C41316	Same as C4101	
C41317	Same as C4101	
C41318	Same as C4180	
C41319	Same as C4180	
C41320	Same as C4101	
C41321	Same as C4101	
C41322	Same as C4101	
C41323	Same as C4101	
C41324	Same as C4101	
C41325	Same as C4180	
C41326	Same as C4180	
C41328	Same as C4180	
C41329	Same as C4180	
C41330	Same as C4180	
C41331	Same as C4180	
C41332	Same as C4180	
C41334	Same as C4180	
C41335	Cap., 10μ, ±20%, 20V, Elect tan.	DCS459011
C41336	Same as C41335	
C41337	Cap., 22μ, ±20%, 10V, Elect tan.	DCS439041
C41338	Same as C41337	
C41339	Same as C41337	
C41340	Cap., 47μ, ±20%, 6.3V, Elect tan.	DCS429011
C41390	Same as C41337	
L41301	Coil, K5 T4-8-2	DCL152061
L41302	Same as L41301	
L41303	Same as L41301	
L41304	Same as L41301	
L41305	Coil, EL0606RA-101J	DCL119121
R4100	Res., 1.0K, ±1%, 1/5W, Metal	DRE999251
R4101	Res., 39, ±5%, 1/4W, Carbon	DRD939081

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
R4108	Res., 100, ±5%, 1/4W, Carbon	DRD939131
R4109	Res., 1.0K, ±5%, 1/4W, Carbon	DRD939251
R4114	Res., 510, ±1%, 1/5W, Metal	DRE999751
R4115	Same as R4114	
R4116	Res., 270, ±5%, 1/4W, Carbon	DRD939181
R4117	Same as R4116	
R4118	Res., 680, ±5%, 1/4W, Carbon	DRD939231
R4119	Res., 150, ±1%, 1/5W, Metal	DRE999151
R4136	Res., 100, Var., 0.5W, Metal	DRV415501
R4137	Same as R4100	
R4150	Res., 3.3M, ±5%, 1/6W, Carbon	DRD198481
R4151	Res., 3.3K, ±1%, 1/5W, Metal	DRE999311
R4152	Res., 390K, ±5%, 1/4W, Carbon	DRD939561
R4153	Res., 51, ±1%, 1/5W, Metal	DRE999671
R4154	Same as R4153	
R4161	Res., 75, ±5%, 1/4W, Carbon	DRD938221
R4162	Res., 2.0K, ±5%, 1/4W, Carbon	DRD939621
R4163	Same as R4109	
R4164	Same as R4118	
R4165	Res., 3.9K, ±1%, 1/5W, Metal	DRE999321
R4166	Same as R4161	
R4167	Res., 47, ±1%, 1/5W, Metal	DRE999091
R4168	Res., 110, ±5%, 1/4W, Carbon	DRD939891
R4169	Res., 500, Var., 0.5W, Cermet	DRV415521
R4170	Res., 360, ±1%, 1/5W, Metal	DRE999611
R4171	Same as R4109	
R4172	Res., 1.2K, ±5%, 1/4W, Carbon	DRD939261
R4173	Res., 330, ±5%, 1/4W, Carbon	DRD939191
R4175	Res., 3.9K, ±5%, 1/4W, Carbon	DRD939321
R4178	Same as R4169	
R4179	Res., 240, ±1%, 1/5W, Metal	DRE999601
R4180	Res., 36K, ±1%, 1/5W, Metal	DRE999861
R4181	Res., 10K, Var., 0.5W, Cermet	DRV415581
R4182	Res., 220, ±1%, 1/5W, Metal	DRE999171
R4184	Res., 20K, ±1%, 1/5W, Metal	DRE999581
R4185	Res., 62K, ±1%, 1/5W, Metal	DRE999871
R4186	Res., 33K, ±5%, 1/4W, Carbon	DRD939431
R4187	Res., 50K, Var., 0.5W, Cermet	DRV415581
R4188	Same as R4162	
R4191	Same as R4186	
R41101	Same as R4101	
R41108	Same as R4108	
R41109	Same as R4109	
R41114	Same as R4114	
R41115	Same as R4114	
R41116	Same as R4116	
R41117	Same as R4116	
R41136	Same as R4136	
R41137	Same as R4100	
R41150	Same as R4150	
R41151	Same as R4151	
R41152	Same as R4152	
R41153	Same as R4153	
R41154	Same as R4153	
R41161	Same as R4161	
R41162	Same as R4109	
R41163	Same as R4109	
R41164	Same as R4118	
R41165	Same as R4165	
R41166	Same as R4161	
R41167	Same as R4167	
R41168	Same as R4168	
R41169	Same as R4169	
R41170	Same as R4170	
R41171	Same as R4109	
R41172	Same as R4172	
R41173	Same as R4173	
R41175	Res., 47K, ±5%, 1/4W, Carbon	DRD939451
R41176	Res., 820, ±5%, 1/4W, Carbon	DRD939241
R41180	Same as R4180	
R41181	Same as R4181	
R41182		
R41184	Same as R4184	
R41185	Same as R4185	
R41186	Res., 12K, ±5%, 1/4W, Carbon	DRD939381
R41187	Same as R4187	
R41188	Same as R4162	
R41200	Res., 270, ±1%, 1/5W, Metal	DRE999181
R41201	Res., 51, ±5%, 1/4W, Carbon	DRD939881
R41202	Res., 1.6K, ±5%, 1/4W, Carbon	DRD938021
R41203	Same as R4179	
R41204	Res., 560, ±1%, 1/5W, Metal	DRE999221
R41205	Res., 620, ±1%, 1/5W, Metal	DRE999761
R41206	Res., 1.1K, ±1%, 1/5W, Metal	DRE999631
R41209	Same as R4186	
R41210	Same as R4109	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
R41211	Res., 18K, ±1%, 1/5W, Metal	DRE999401
R41212	Res., 13K, ±1%, 1/5W, Metal	DRE999651
R41218	Res., 160, ±5%, 1/4W, Carbon	DRD939911
R41219	Res., 240, ±5%, 1/4W, Carbon	DRD939931
R41220	Res., 510, ±5%, 1/4W, Carbon	DRD939851
R41222	Same as R4109	
R41223	Same as R4109	
R41231	Res., 180, ±1%, 1/5W, Metal	DRE999011
R41232	Same as R41205	
R41233	Same as R41205	
R41240	Same as R4109	
R41241	Same as R4172	
R41242	Same as R4109	
R41243	Same as R4173	
R41244	Same as R4109	
R41245	Same as R4172	
R41246	Same as R4109	
R41247	Same as R4173	
R41251	Same as R4172	
R41261	Same as R41202	
R41262	Same as R41202	
R41263	Res., 47, ±5%, 1/4W, Carbon	DRD939091
R41264	Same as R41263	
R41265	Res., 750, ±5%, 1/4W, Carbon	DRD939971
R41266	Same as R41202	
R41267	Same as R41202	
R41268	Same as R41202	
R41269	Same as R41202	
R41270	Res., 27K, ±5%, 1/4W, Carbon	DRD939421
R41271	Res., 10K, ±5%, 1/4W, Carbon	DRD939371
R41272	Same as R41271	
R41273	Same as R4184	
R41274	Same as R4109	
R41275	Same as R41271	
R41276	Res., 22K, ±5%, 1/4W, Carbon	DRD939411
RA4110	Resistor Array, 47, ±5%	DFB016781
RA41110	Same as RA4110	
D4101	Diode Array CA3039	DDD991171
D4105	Diode 1SS97	DDD010551
D4106	Same as D4105	
D4107	Same as D4105	
D4108	Same as D4105	
D4109	Diode 8.2EB3	DDD034951
D4110	Same as D4109	
D4111	Diode 5.6EB TA21R	DDD031781
D4112	Diode IS953 TA21R	DDD010821
D4133	Diode RD6.2EB2 TA21R	DDD033121
D4161	Same as D4133	
D4162	Diode RD5.1EB3 TA21R	DDD032121
D4163	Diode 1S1544A	DDD010801
D4170	Same as D4163	
D4180	Same as D4105	
D4181	Same as D4105	
D4182	Same as D4105	
D4183	Same as D4105	
D4191	Diode 1SS97 TA21R	DDD019101
D4192	Diode 1S953 TA21R	DDD010821
D4193	Same as D4191	
D4194	Same as D4192	
D4195	Same as D4112	
D4196	Same as D4112	
D41101	Same as D4101	
D41105	Same as D4105	
D41106	Same as D4105	
D41107	Same as D4105	
D41108	Same as D4105	
D41109	Same as D4109	
D41110	Same as D4109	
D41133	Same as D4133	
D41161	Same as D4133	
D41162	Same as D4112	
D41163	Same as D4163	
D41170	Same as D4163	
D41180	Same as D4105	
D41181	Same as D4105	
D41182	Same as D4105	
D41183	Same as D4105	
D41200	Diode TLR102	DDD070231
D41201	Z. Diode HZ5C1	DDD034751
D41202	Same as D4112	
D41241	Z. Diode HZ7C2	DDD034931
D41242	Same as D4112	
D41243	Same as D4112	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
D41261	Same as D41241	
D41262	Same as D41241	
Q4103	Transistor, 2SA1206 TRC	DTR119041
Q4104	Same as Q4103	
Q4105	Transistor, 2SC2037	DTR137591
Q4106	Same as Q4105	
Q4107	Transistor, 2SA594	DTR110351
Q4136	Transistor, μPA 60AM	DTR295271
Q4161	Same as Q4105	
Q4162	Same as Q4105	
Q4163	Transistor, 2N4392	DTR255011
Q4166	Transistor, μPA 60AL	DTR295301
Q4167	Transistor, SD215DE	DTR295141
Q4170	Transistor, 2SA1015Y TPER1	DTR119011
Q4191	Transistor, 1815GR TPER1	DTR139011
Q41103	Same as Q4103	
Q41104	Same as Q4103	
Q41105	Same as Q4105	
Q41106	Same as Q4105	
Q41136	Same as Q4136	
Q41161	Same as Q4103	
Q41162	Same as Q4103	
Q41163	Same as Q4163	
Q41166	Same as Q4166	
Q41167	Same as Q4167	
Q41170	Same as Q4170	
Q41200	Transistor, 2SC2901	DTR135741
Q41201	Same as Q41200	
Q41202	Same as Q4191	
Q41207	Same as Q4105	
Q41208	Same as Q4105	
Q41231	Same as Q4103	
Q41232	Same as Q4103	
Q41241	Transistor, 2N3905	DTR150011
Q41242	Same as Q41241	
Q41248	Transistor, 2SB648C	DTR125091
Q41270	Same as Q4191	
Q41271	Same as Q4170	
Q41272	Same as Q4170	
IC4101	IC, μPC251C	DIC610091
IC4102	HIC, B239	DIC822391
IC4130	HIC, B237	DIC822371
IC4131	Same as IC4102	
IC4161	IC, TL810CP	DIC630731
IC4162	IC, LF353H	DIC613641
IC4170	Same as IC4102	
IC4172	Same as IC4102	
IC41130	HIC, B238	DIC822381
IC41131	Same as IC1402	
IC41161	Same as IC4161	
IC41162	Same as IC4162	
IC41202	IC, SN74LS123N	DIC141181
IC41203	IC, SN74LS74AN	DIC140751
IC41204	IC, MC10H131L	DIC322241
IC41205	IC, MC10H105L	DIC322211
IC41206	IC, SN74LS00N	DIC140011
RL4101	Relay, SY-12	DKD027301
RL4162	Same as RL4101	
P41201	Connector, 008272230001162	DCN992211
JP4103	Mini-latch housing 65039-034	DCN033121
DL4101	Delay cable, SIL20N101	DZB990221
TP4105	Straight header 65507-136	DCN033501

INPUT MEMORY (I) 50

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C5000	Cap., 0.1μ, +80~-20%, 50V, Cer	DCC137091
C5001	Cap., 22μ, ±20%, 10V, Elect. tan	DCS431501
C5002	Same as C5000	
C5010	Cap., 0.01μ, +80~-20%, 50V, Cer	DCC133571
C5011	Same as C5000	
C5012	Same as C5000	
C5013	Same as C5010	
C5014	Same as C5010	
C5015	Same as C5010	
C5016	Same as C5000	
C5017	Same as C5000	
C5018	Same as C5000	
C5019	Same as C5000	
C5020	Same as C5000	
C5021	Same as C5000	
C5022	Same as C5000	
C5023	Same as C5000	
C5024	Same as C5000	
C5025	Same as C5000	
C5026	Same as C5000	
C5027	Same as C5000	
C5028	Same as C5000	
C5029	Same as C5000	
C5030	Same as C5000	
C5031	Same as C5000	
C5032	Same as C5000	
C5033	Same as C5010	
C5034	Same as C5010	
C5035	Same as C5010	
C5036	Same as C5010	
C5037	Same as C5010	
C5038	Same as C5010	
C5039	Same as C5010	
C5040	Same as C5010	
C5041	Same as C5010	
C5042	Same as C5010	
C5043	Same as C5010	
C5044	Same as C5010	
C5045	Same as C5010	
C5050	Cap., 100p, ±5%, 50V, Cer	DCC239051
C5051	Cap., 270p, ±5%, 50V, Cer	DCC239281
C5052	Cap., 150p, ±5%, 50V, Cer	DCC239021
C5053	Same as C5051	
C5054	Cap., 20p, ±5%, 50V, Cer	DCC239331
L5000	Coil, K5 T4-8-2(8T)	DCL152061
R5000	Res., 10K, ±5%, 1/5W, Carbon	DRD939371
R5001	Same as R5000	
R5050	Res., 200, ±5%, 1/5W, Carbon	DRD939921
RA5000	Resistor array, 6-4.7KJ	DFB015531
D5000	Diode, 1S 953, NEC	DDD010821
D5001	Same as D5000	
D5002	Same as D5000	
Q5000	Transistor, 2SC 2901, NEC	DTR135741
Q5001	Same as Q5000	
IC501A	IC, 74F74PC, FC	DIC198021
IC501B	IC, 74F08PC, FC	DIC198051
IC501C	IC, MC74HC04N, TEXS, MOT, TOS, HIT	DIC440051
IC501D	IC, 74F32PC, FC	DIC198091
IC501E	IC, ADL-025S	DZB990241
IC501F	Same as IC501A	
IC501G	Same as IC501E	
IC501H	IC, MC74HC74N	DIC440751
IC501J	IC, MC74HC00N	DIC440011
IC501K	IC, 74F157PC	DIC198151
IC501L	Same as IC501H	
IC501M	Same as IC501H	
IC501N	IC, SN74LS31N	DIC155311
IC502B	Same as IC501H	
IC502C	IC, SN 74ALS561N, TEXS	DIC192351
IC502D	Same as IC502C	
IC502E	Same as IC502C	
IC502F	IC, 74F04PC	DIC198001
IC502G	Same as IC502C	
IC502H	Same as IC502C	
IC502J	Same as IC502C	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
IC502K	IC, MC74H161N	DIC441621
IC502L	IC, 74F161PC	DIC198241
IC502M	Same as IC502L	
IC502N	Same as IC501B	
IC503L	IC, MC 74HC85N	DIC440861
IC503M	IC, MC 74HC157N	DIC441581
IC503N	Same as IC501C	
IC504K	IC, MC 74HC374N	DIC443751
IC504L	Same as IC503L	
IC504M	Same as IC503L	
IC504N	IC, 74F161PC	DIC198241
P5000	Connector, 00-8272-396-000-163	DCN991131

INPUT MEMORY (II) 51

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
IC511C	IC, MC 74HC04N, TEXS, MOT, TOS, HIT	DIC440051
IC512A	IC, MC 74HC20N	DIC440211
IC512F	IC, 74f04PC	DIC198001
IC513A	IC, MC74HC04N	DIC440051
IC513B	IC, μPD 2149D-2, NEC	DIC515521
IC513C	Same as IC513B	
IC513D	Same as IC513B	
IC513E	Same as IC513B	
IC513F	IC, MC 74HC244N	DIC442451
IC513G	Same as IC513B	
IC513H	Same as IC513B	
IC513J	Same as IC513B	
IC513K	Same as IC513B	
IC514A	Same as IC512A	
IC514B	IC, MC 74HC138N	DIC441391
IC514C	IC, Same as IC513F	
IC514D	IC, 74 HC374N	DIC443751
IC514E	Same as IC514D	
IC514F	Same as IC513F	
IC514G	Same as IC513F	
IC514H	Same as IC514D	
IC514J	Same as IC513F	

CPU CIRCUIT (I) 52

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C5200	Cap., 0.1μ, +80~20%, 50V, Cer	DCC137091
C5201	Same as C5200	
C5202	Cap., 22μ, ±20%, 10V, Elect. tan	DCS439041
C5211	Same as C5200	
C5212	Cap., 1000p, ±10%, 50V, Cer	DCC139051
C5213	Same as C5200	
C5214	Same as C5212	
C5215	Same as C5212	
C5216	Same as C5212	
C5217	Same as C5200	
C5218	Same as C5200	
C5219	Same as C5212	
C5220	Same as C5212	
C5221	Same as C5200	
C5222	Same as C5200	
C5223	Same as C5212	
C5224	Same as C5200	
C5225	Same as C5212	
C5226	Same as C5200	
C5227	Same as C5200	
C5228	Same as C5200	
C5229	Same as C5200	
C5230	Cap., 0.01μ, +80~20%, 50V, Cer	DCC133571
C5231	Same as C5200	
C5232	Same as C5200	
C5233	Same as C5200	
C5234	Same as C5200	
C5235	Same as C5200	
C5236	Same as C5200	
C5237	Same as C5200	
C5238	Same as C5230	
C5239	Same as C5230	
C5240	Same as C5200	
C5241	Same as C5230	
C5242	Same as C5230	
C5243	Same as C5230	
C5244	Same as C5200	
C5245	Same as C5200	
C5246	Same as C5200	
C5247	Same as C5200	
C5248	Same as C5200	
C5249	Same as C5200	
C5250	Same as C5200	
C5251	Same as C5200	
C5270	Same as C5212	
C5271	Same as C5212	
C5273	Cap., 47, ±5%, 50V, Cer	DCC239031
C5274	Cap., 120, ±5%, 50V, Cer	DCC239261
C5280	Cap., 3.3μ, ±20%, 16V, Elect. tan	DCS441001
C5290	Same as C5200	
C5291	Same as C5200	
C5292	Same as C5202	
L5200	Coil, K5 T5-8-2 (8T)	DCL152061
L5290	Same as L5200	
R5200	Res., 4.7K, ±5%, 1/5W, Carbon	DRD939331
R5201	Same as R5200	
R5270	Same as R5200	
R5274	Res., 220, ±5%, 1/5W, Carbon	DRD939171
R5280	Res., 240, ±5%, 1/5W, Carbon	DRD939931
R5281	Res., 5.1K, ±5%, 1/5W, Carbon	DRD939651
R5282	Res., 1.0K, ±5%, 1/5W, Carbon	DRD939251
RA5200	Resistor array, IHR-4-181J-271JE	DFB014321
RA5201	Resistor array, IHR-6-181J-271JE	DFB014341
IC5201D	IC, MC 10H158L, MOT	DIC322261
IC5201F	IC, F10124DC, FC, MOT, HIT	DIC310061
IC5202D	IC, F10125DC, FC, MOT, HIT	DIC310071
IC5202F	IC, MC 10H131L, MOT	DIC322241
IC5208E	IC, MC 74HC00N 1/2	DIC440011
IC5208G	IC, MC74HC390N	DIC443911
IC5208H	Same as IC5208G	
IC5208J	Same as IC5208G	
IC5209F	IC, MC 74HC125N 1/2	DIC441261
IC5209G	IC, MC 74HC153N	DIC441541
IC5209H	IC, MC 74HC138N	DIC441391
IC5209J	IC, MC 74HC151N	DIC441521
IC5210B	IC, MC74HC74N	DIC440751
IC5210C	IC, MC 74HC174N	DIC441751
IC5210F	IC, MC74HC08N 1/2	DIC440091

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
IC5210F	IC, TC74HC123P	DIC492291
IC5210G	IC, MC 74HC04N	DIC440051
IC5210H	Same as IC5210B	
IC5210J	IC, MC 74HC393N	DIC443941
J5201	Connector, M36M87-03	DCN034611
P5200	Connector, 00-8272-396-000-163	DCN991131
X5200	Crystal oscillator, TD308A 40MHz	DHF010581

CPU CIRCUIT (II) 53

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PARTS NO.
C5320	Cap., 0.22μ, ±50%, 50V, Cer.	DCC237451
C5321	Cap., 1000p, ±10%, 50V, Cer.	DCC139051
C5350	Cap., 0.01μ, +80~−20%, 50V, Cer.	DCC133521
C5355	Cap., 100, ±5%, 50V, Cer.	DCC234001
C5356	Same as C5355	
R5300	Res., 4.7K, ±5%, 1/5W, Carbon	DRD939331
R5301	Same as R5300	
R5302	Res., 2.2K, ±5%, 1/5W, Carbon	DRD939291
R5320	Res., 5.1K, ±5%, 1/5W, Carbon	DRD939651
R5321	Res., 18K, ±0.5%, 1/5W, Metal	DRE998291
R5322	Res., 2.2K, ±0.5%, 1/5W, Metal	DRE998261
R5323	Res., 18K, ±5%, 1/5W, Carbon	DRD939401
R5324	Res., 3.3K, ±5%, 1/5W, Carbon	DRD939311
D5325	Res., 9.1K, ±5%, 1/5W, Carbon	DRD939671
R5326	Res., 6.8K, ±5%, 1/5W, Carbon	DRD939351
R5327	Res., 1.0K, ±5%, 1/5W, Carbon	DRD939251
R5238	Same as R5302	
R5350	Same as R5300	
RA5300	Resistor array, 8—4.7KJ	DFB015791
RA5301	Same as RA5300	
RA5302	Same as RA5300	
RA5303	Resistor array, 6—4.7KJ	DFB015881
RA5304	Resistor array, 4—4.7KJ	DFB015851
Q5320	Transistor, 2SA1300BL, TOS	DTR116251
Q5321	Transistor, 2SC1815GR, TOS	DTR139011
Q5322	Transsitor, 2SA1015Y, TOS	DTR119011
IC532G	IC, TL 7700CP, TEXS	DIC690151
IC534J	IC, MC 74HC04N	DIC440051
IC535J	IC, MC 74HC244N	DIC442451
IC536B	IC, MC 74HC32N	DIC440331
IC536C	IC, μPD 8279C-5, NEC	DIC555391
IC536E	IC, MC 74HC30N	DIC440311
IC536F	IC, MC 74HC08N	DIC440091
IC536G	IC, MC 74HC244N	DIC442451

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
IC536J	IC, μPD 78C-1, NEC	DIC550631
IC537B	Same as IC534J	
IC537E	IC, MC 74HC374N	DIC443751
IC537F	IC, MC 74HC245N	DIC442461
IC537G	Same as IC536G	
IC538F	IC, MC 74HC74N	DIC440751
BT5320	Dry cell (Ni–Cd), 3–50FT	DES010441

CPU CIRCUIT (III) 54

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C5450	Cap., 0.1μ, +80~–20%, 50V, Cer.	DCC137091
RA5400	Resistor array, 4–4.7KJ	DFB015851
IC543C	IC, HM 6264LP-15, HIT	DIC515531
IC543E	Same as IC543C	
IC543F	Same as IC543C	
IC544G	IC, MC 74HC86N	DIC440871
IC544H	IC, MC 74HC21N	DIC440221
IC545C	IC, MBM 27C256-30, FUJ	DIC525381
IC545E	Same as IC545C	
IC545F	Same as IC545C	
IC545H	IC, MC 74HC154N	DIC441551
IC548A	IC, MC 74HC174N	DIC441751
IC548B	IC, MC 74HC138N	DIC441391
IC548C	IC, MC 74HC04N	DIC440051
IC548D	IC, MC 74HC32N	DIC440331
IC549A	Same as IC548A	
IC549B	IC, MC 74HC14N	DIC440151
IC549D	IC, MC 74HC74N	DIC440751
IC549E	Same as IC549D	
IC5410A	Same as IC548A	
IC5410D	IC, MC 74HC11N	DIC440121

DISPLAY MEMORY (I) 55

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C5500	Cap., 0.1μ, +80~−20%, 50V, Cer.	DCC137091
C5501	Same as C5500	
C5502	Cap., 22μ, ±20%, 10V, Elect tan.	DSC439041
C5510	Cap., 0.01μ, +80~−20%, 50V, Cer.	DCC133571
C5511	Same as C5510	
C5512	Same as C5510	
C5513	Same as C5510	
C5514	Same as C5510	
C5515	Same as C5510	
C5516	Same as C5510	
C5517	Same as C5500	
C5518	Same as C5500	
C5519	Same as C5500	
C5520	Same as C5510	
C5521	Same as C5510	
C5522	Same as C5510	
C5523	Same as C5500	
C5524	Same as C5500	
C5525	Same as C5500	
C5526	Same as C5500	
C5527	Same as C5500	
C5528	Same as C5510	
C5529	Same as C5510	
C5530	Same as C5510	
C5531	Same as C5510	
C5532	Same as C5500	
C5533	Same as C5510	
C5534	Same as C5500	
C5535	Same as C5510	
C5536	Same as C5500	
C5537	Same as C5510	
C5538	Same as C5510	
C5539	Same as C5510	DCC133571
C5540	Same as C5500	
C5541	Same as C5510	
C5542	Same as C5510	
C5543	Same as C5500	
C5544	Same as C5510	
C5545	Same as C5510	
C5546	Same as C5510	
C5547	Same as C5500	
C5548	Same as C5510	
C5549	Same as C5500	
C5550	Same as C5510	
C5551	Same as C5500	
C5552	Same as C5500	
C5553	Same as C5510	
C5554	Same as C5510	
C5555	Same as C5510	
C5556	Same as C5500	
C5557	Same as C5510	
C5558	Same as C5510	
C5559	Same as C5500	
C5580	Cap., 0.22μ, ±20%, 50V, Cer.	DCC237451
C5581	Cap., 270, ±5%, 50V, Cer.	DCC234701
L5500	Coil, K5, T4-8-2 (8T)	DCL152061
R5500	Res., 240Ω, 5%, 1/5W, Carbon	DRD939931
RA5500	Res., 4.7KΩ x 7, 5%, Carbon	DFB011701
IC552H	IC, MC 74HC04N	DIC440091
IC553C	IC, MC 74HC20N	DIC440211
IC553D	IC, MC 74HC138N	DIC441391
IC553J	IC, MC 74HC08N	DIC440051
IC553K	IC, MC 74HC154N	DIC441551
IC554K	Same as IC553J	
IC556A	IC, MC 74HC74N	DIC440751
IC556B	Same as IC556A	
IC556H	IC, MC 74HC174N	DIC441751
IC556J	IC, SN 74LS31N, TEXS	DIC155311
IC556K	IC, MC 74HC32N	DIC440331
IC557A	IC, MC 74HC27N	DIC440281
IC557B	Same as IC552H	
IC557C	Same as IC554K	
IC557D	IC, MC 74HC02N	DIC440281
IC557E	IC, 556K	
IC557F	IC, MC 74HC393N	DIC443941
IC557G	Same as IC552H	
IC557H	IC, MC 74HC393N	DIC443941

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
IC557H	IC, MC 74HC151N	DIC441521
IC557J	Same as ICIC557F	
IC558G	Same as IC556K	
IC558C	Same as IC556A	
IC558F	IC, MC 74HC132N	DIC441331
IC558G	Same as IC556A	
IC558H	IC, MC 74HC00N	DIC440011
IC559A	IC, MC 74HC390N	DIC443911
IC559B	Same as IC557D	
IC559C	Same as IC556J	
IC559D	Same as IC558H	
IC559E	Same as IC558H	
IC559F	IC, MC 74HC157N	DIC441581
IC559G	Same as IC556A	
P5500	Connector, 00-8272-396000-163	DCN991131

DISPLAY MEMORY (II) 56

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
RA5600	Res., 4.7KΩ x 8, 5%, Carbon	DFB015791
IC561C	IC, MC 74HC174N	DIC441751
IC561D	IC	
IC561E	IC, MC 74HC244N	DIC442451
IC561F	IC, MC 74HC374N	DIC443751
IC561G	IC, MC 74HC153N	DIC441541
IC561H	IC, MC 74HC157N	DIC441581
IC561J	Same as IC561H	
IC561K	Same as IC561H	
IC562C	Same as IC561C	
IC562D	Same as IC561C	
IC562E	Same as IC561E	
IC562F	Same as IC561F	
IC562J	IC, MC 74HC08N	DIC440051
IC563E	IC, MC 74HC125N	DIC441261
IC563F	Same as IC561E	
IC563G	IC, HM 6116P-3HIT	DIC515021
IC563H	Same as IC563G	
IC564G	IC, MC 74HC245N	DIC442461
IC564H	Same as IC561C	
IC565F	Same as IC563E	

DISPLAY MEMORY (III) 57

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C5700	Cap., 580, ±5%, 50V, Cer.	DCC131601
IC572K	IC, MC 74HC125N	DIC441261
IC574C	IC, MC 74HC374N	DIC443751
IC574D	Same as IC574C	
IC574E	IC, MC 74HC273N	DIC442741
IC574F	IC, MC 74HC244N	DIC442451
IC574J	IC, MC 74HC174N	DIC441751
IC575B	IC, MC 74HC74N	DIC440751
IC575C	IC, MC 74HC85N	DIC440861
IC575D	Same as IC575C	
IC575E	IC, MC 74HC161N	DIC441621
IC575G	Same as IC575E	
IC575H	Same as IC575E	
IC575J	IC, MC 74HC153N	DIC441541
IC575K	Same as IC575B	
IC576C	Same as IC575C	
IC576D	Same as IC575C	
IC576E	Same as IC575E	
IC576F	IC, MC 74HC08N	
IC576G	Same as IC575E	
IC577K	Same as IC575B	
IC578A	IC, MC 74HC10N	DIC440111
IC578D	IC, SN 74LS31N, TEXS	DIC155311
IC578E	IC, MC 74HC157N	DIC441581
IC578J	Same as IC578E	
IC578K	Same as IC575B	
IC579H	Same as IC575E	
IC579J	Same as IC575E	
IC579K	Same as IC575E	

CHARACTER CIRCUIT (I) 58

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C5800	Cap., 0.1μ, +80~−20%, 50V, Cer.	DCC137091
C5801	Same as C5800	
C5802	Cap., 10p, ±20%, 20V, Elect. tan.	DCS451301
C5804	Same as C5800	
C5805	Same as C5800	
C5806	Same as C5802	
C5807	Same as C5800	
C5808	Same as C5800	
C5809	Cap., 22p, ±20%, 10V, Elect. tan.	DCS439041
C5810	Same as C5800	
C5811	Same as C5800	
C5812	Cap., 0.01μ, +80~−25%, 50V, Cer.	DCC133571
C5813	Same as C5800	
C5814	Same as C5800	
C5815	Same as C5800	
C5816	Same as C5812	
C5817	Same as C5812	
C5818	Same as C5800	
C5919	Same as C5800	
C5920	Same as C5812	
C5821	Same as C5812	
C5822	Same as C5812	
C5823	Same as C5012	
C5824	Same as C5012	
C5825	Same as C5012	
C5826	Same as C5800	
C5827	Same as C5800	
C5828	Same as C5800	
C5829	Same as C5800	
C5830	Same as C5800	
C5831	Same as C5800	
C5832	Same as C5800	
C5833	Same as C5800	
C5834	Same as C5800	
C5835	Same as C5800	
C5836	Same as C5800	
C5837	Same as C5800	
C5838	Same as C5800	
C5839	Same as C5800	
C5841	Same as C5800	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C5842	Cap., 2p, ±0.25pF, 50V, Cer.	DCC239061
C5843	Same as C5842	
C5844	Cap., 150p, ±5%, 300V, Mica	DCM253411
C5845	Same as C5844	
C5846	Cap., 0.01μ, ±0.25%, 50V, Film	DCF125761
C5847	Same as C5812	
C5848	Same as C5812	
C5849	Cap., 0.22μ, ±20%, 100V, Film	DCF135131
C5950	Same as C5849	
C5851	Same as C5812	
C5852	Same as C5812	
C5853	Same as C5812	
C5854	Same as C5812	
C5855	Same as C5800	
C5856	Same as C5800	
C5857	Same as C5812	
C5859	Cap., 47p, ±5%, 50V, Cer.	DCC239031
C5860	Same as C5800	
C5861	Same as C5800	
C5862	Same as C5800	
C5863	Same as C5800	
C5864	Same as C5800	
C5865	Same as C5800	
C5866	Same as C5800	
C5867	Same as C5800	
C5868	Same as C5800	
C5871	Same as C5800	
C5872	Same as C5842	
C5873	Same as C5842	
C5874	Same as C5844	
C5875	Same as C5844	
C5876	Same as C5846	
C5877	Same as C5812	
C5878	Same as C5812	
C5879	Same as C5949	
C5880	Same as C5949	
C5883	Same as C5812	
C5884	Same as C5812	
C5885	Same as C5800	
C5886	Same as C5800	
C5886	Same as C5800	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C5887	Same as C5812	
C5889	Cap., 82p, ±5%, 50V, Cer.	DCC239141
C5890	Same as C5859	
C5891	Same as C5812	
C5893	Same as C5800	
C5897	Same as C5800	
C5899	Cap., 47p, ±5%, 300V, Mica	DCM252711
L5800	Coil, K5 T4-8-2	DCL152061
L5801	Same as L5800	
L5802	Same as L5800	
R5800	Res., 1.3K, ±5%, 1/5W, Carbon	DRD938011
R5801	Res., 100, ±5%, 1/5W, Carbon	DRD939131
R5830	Res., 510, ±5%, 1/5W, Carbon	DRD939851
R5831	Res., 47, ±5%, 1/5W, Carbon	DRD939091
R5932	Res., 620, ±5%, 1/5W, Carbon	DRD939961
R5833	Same as R5832	
R5834	Res., 1.5K, ±1%, 1/5W, Metal	DRE999271
D5835	Same as R5834	
R5840	Res., 2.4K, ±1%, 1/5W, Metal	DRE999791
R5841	Res., 2.4K, ±5%, 1/5W, Carbon	DRD938031
R5842	Res., 3.0K, ±1%, 1/5W, Metal	DRE999511
R5844	Res., 620, ±1%, 1/5W, Metal	DRE999761
R5945	Res., 510, ±1%, 1/5W, Metal	DRE999751
R5846	Res., 4.3K, ±1%, 1/5W, Metal	DRE999521
R5847	Res., 120, ±5%, 1/5W, Carbon	DRD939141
R5848	Res., 5K, ±0.25%, 1/8W, Metal	DRE221521
R5849	Same as R5848	
R5850	Same as R5830	
R5851	Same as R5830	
R5852	Same as R5834	
R5853	Res., 1.0K, ±1%, 1/5W, Metal	DRE999251
R5854	Same as R5830	
R5855	Res., 2.0K, ±1%, 1/5W, Metal	DRE999641
R5856	Res., 1.2K, ±1%, 1/5W, Metal	DRE999261
R5857	Same as R5840	
R5858	Same as R5841	
R5859	Same as R5830	
R5860	Same as R5847	
R5861	Same as R5830	
R5862	Same as R5830	
R5863	Same as R5830	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
R5865	Res., 1.0K, ±5%, 1/5W, Carbon	DRD939251
R5866	Res., 430, ±5%, 1/5W, Carbon	DRD939951
R5867	Res., 470, ±5%, 1/5W, Carbon	DRD939211
R5868	Same as R5867	
R5869	Same as R5832	
R5870	Same as R5840	
R5871	Same as R5841	
R5872	Same as R5842	
R5874	Same as R5844	
R5875	Same as R5845	
R5876	Same as R5846	
R5877	Same as R5847	
R5878	Same as R5848	
R5879	Same as R5848	
R5880	Same as R5830	
R5881	Same as R5830	
R5882	Same as R5834	
R5883	Same as R5853	
R5884	Same as R5830	
R5885	Same as R5853	
R5886	Res., 2.2K, ±1%, 1/5W, Metal	DRE999301
R5887	Same as R5855	
R5888	Same as R5841	
R5889	Same as R5830	
R5890	Same as R5847	
R5891	Same as R5830	
R5892	Same as R5830	
R5893	Same as R5830	
R5894	Res., 10K, ±1%, 1/5W, Metal	DRE999371
R5895	Res., 10K, Var., 0.5W, Cermet	DRV415561
R5896	Res., 1K, Var., 0.5W, Cermet	DRV415531
R5899	Same as R5855	
D5800	Diode, NZ5C1, HIT	DDD034751
Q5800	Transistor, 2SC1815GF, TOS	DTR139011
Q5840	Transistor, 2SA1206, NEC	DTR119041
Q5841	Transistor, SD215DE, CIR	DRT295141
Q5842	Same as Q5841	
Q5843	Same as Q5840	
Q5870	Same as Q5840	
Q5871	Same as Q5841	
Q5872	Same as Q5841	
Q5873	Same as Q5840	
Q5899	Transistor, 2N3905, NEC	DTR150011
IC581G	IC, TC74HC123P	DIC492291
IC581H	IC, MC74HC86N	DIC440871
IC582G	IC, MC74HC74N	DIC440751
IC582H	IC, MC74HC138N	DIC441391
IC585A	IC, MC74HC11N	DIC440121
IC585B	IC, MC74HC20N	DIC440211
IC586E	Same as IC582H	
IC5800	IC, μPC258C, NEC	DIC613571
IC5840	IC, MC3410CL, MOT	DIC641581
IC5841	IC, LF353H, NS	DIC613641
IC5843	Same as IC5841	
IC5844	IC, LF353H, NS	DIC613641
IC5845	IC, HI3-201-5, HAR	DIC632551
IC5846	Same as IC5841	
IC5847	Same as IC5845	
IC5848	Same as IC5845	
IC5849	Same as IC5800	
IC5850	Same as IC5841	
IC5851	IC, μPC624C, NEC	DIC641761
IC5870	Same as IC5840	
IC5871	Same as IC5841	
IC5873	Same as IC5841	
IC5874	Same as IC5844	
IC5875	Same as IC5845	
IC5878	Same as IC5845	
IC5880	Same as IC5841	
IC5881	Same as IC5851	
J5801	Connector, M36-M87-02	DCN034601
J5802	Same as J5801	
P5800	Connector, 00-8272-396-00-163	DCN991131
P5801	Connector, M36-02-30-134P, MIT	DCN034901
P5802	Same as P5801	

CHARACTER CIRCUIT (II) 59

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C5900	Cap., 150p, ±5%, 300V, Mica	DCM253411
C5901	Cap., 1000p, ±10%, 50V, Film	DCF129071
C5902	Cap., 82p, ±5%, 300V, Mica	DCM253111
C5903	Cap., 240p, ±5%, 300V, Mica	DCM253761
C5904	Same as C5901	
C5905	Cap., 0.01μ, +80~20%, 50V, Cer.	DCC133571
C5906	Cap., 1000p, ±5%, 50V, Film	DCF129251
C5910	Cap., 470p, ±5%, 500V, Cer.	DCC239151
C5950	Cap., 390p, ±5%, 50V, Cer.	DCC235101
C5951	Cap., 1000p, ±10%, 50V, Cer.	DCC139051
C5952	Same as C5905	
R5900	Res., 2.0K, ±1%, 1/5W, Metal	DRE999641
R5901	Res., 43K, ±5%, 1/5W, Carbon	DRD939691
R5902	Res., 2.0K, ±5%, 1/5W, Carbon	DRD939621
R5903	Same as R5900	
R5904	Res., 4.7K, ±1%, 1/5W, Metal	DRE999331
R5905	Same as R5902	
R5906	Res., 27K, ±5%, 1/5W, Carbon	DRD939421
R5907	Res., 11K, ±5%, 1/5W, Carbon	DRD938061
R5908	Same as R5907	
R5909	Res., 5.1K, ±5%, 1/5W, Carbon	DRD939651
R5910	Same as R5909	
R5950	Res., 1.0K, ±5%, 1/5W, Carbon	DRD939251
RA5900	Resistor array, 5–4.7KJ	DFB016151
RA5901	Resistor array, 4–4.7KJ	DFV915851
Q5900	Transistor, 2SA1015Y, TOS	DTR119011
Q5901	Same as Q5900	
IC491E	IC, μPC624C, NEC	DIC641761
IC591F	IC, SN74LS31N	DIC155311
IC591J	IC, MC74HC04N	DIC440051
IC592E	IC, MC74HC374N	DIC443751
IC592J	IC, MC74HC74N	DIC440751
IC593G	IC, MC74HC157N	DIC441581
IC593H	IC, MC74HC193N	DIC441941
IC593J	IC, MC74HC42N	DIC440431
IC594G	Same as IC592J	
IC594H	Same as IC591F	
IC594J	IC, MC74HC32N	DIC440331
IC594K	Same as IC593G	
IC594L	Same as IC593H	
IC594M	Same as IC593H	
IC595G	Same as IC591F	
IC595H	Same as IC591J	
IC595J	IC, MC74HC08N	DIC440091
IC595K	Same as IC592J	
IC595L	Same as IC593G	
IC595M	Same as IC593H	
IC596A	IC, IC74HC123P	DIC492291
IC596C	IC, MC74HC00N	DIC440011
IC596D	Same as IC591J	
IC596F	Same as IC594J	
IC596G	Same as IC596A	
IC596H	Same as IC591F	
IC596J	Same as IC596A	
IC596K	Same as IC596A	
IC596L	Same as IC592J	
IC596M	Same as IC595J	
IC597B	IC, MC74HC02N	DIC440031
IC597C	Same as IC592J	
IC597D	IC, MC74HC161N	DIC441621
IC597E	Same as IC597D	
IC597H	Same as IC592J	
IC597J	Same as IC591F	

CHARACTER CIRCUIT (III) 60

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.	CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
RA6000	Resistor array, 8—4.7KJ	DFB015791			
RA6001	Same as RA6000				
IC601L	IC, MC74HC283N	DIC442841			
IC601M	Same as IC601L				
IC602D	IC, MC74HC244N	DIC442451			
IC602F	Same as IC602D				
IC602K	Same as IC601L				
IC602L	Same as IC601L				
IC602M	Same as IC601L				
IC603D	IC, HM6116P-3, HIT	DIC515021			
IC603F	IC, MBM2764-30, FUJ	DIC525131			
IC603K	Same as IC601L				
IC603L	Same as IC601L				
IC603M	Same as IC601L				
IC605C	IC, MC74HC157N	DIC441581			
IC605D	Same as IC605C				
IC605E	Same as IC605C				
IC605F	IC, MC74HC193N				
IC606B	IC, MC74HC27N				
IC607F	IC, MC74HC74N	DIC440751			
IC607K	IC, MC74HC00N	DIC440011			

MOTHER BOARD 61

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
R6100	Res., 2.4K, ±5%, 1/5W, Carbon	DRD938031
R6101	Same as R6100	
R6102	Res., 1.5K, ±5%, 1/5W, Carbon	DRD939271
R6120	Same as R6100	
R6121	Res., 3.6K, ±5%, 1/5W, Carbon	DRD938041
R6122	Same as R6100	
R6123	Same as R6121	
R6124	Same as R6102	
RA6100	Resistor array, 4-1K J	DFB015841
RA6120	Resistor array, 8-1K J	DFB016321
IC6100	IC, TLP521-3, TOS	DFB030371
IC6101	Same as IC6100	
IC6120	Same as IC6100	
IC6121	Same as IC6100	
IC6122	Same as IC6100	
IC6123	IC, TLP521-1	DFB030331
J6100	Connector, 00 8272 264 949 162	DCN990211
J6101	Connector, 00 8272 396 949 163	DCN991111
J6102	Same as J6101	
J6103	Same as J6101	
J6104	Same as J6101	
J6105	Connector, 00 8272 230 949 162	DCN99221
J6110	Connector, M31M87-08, MIT	DCN034511
J6111	Same as J6110	
J6112	Connector, M36M87-03, MIT	DCN034611
J6120	Connector, 65043-023, MIT	DCN031681
J6130	Connector, M31M87-07, MIT	DCN034501
J6131	Same as J6130	
J6132	Connector, M36M87-06	DCN034641
J6140	Connector, 128-08-10-281S	DCN032091
P6100	Connector, 65625-172	DCN033551
T6100	Coil, K7A T5-10-2.5 (13Tx13T)	DCL152041
T6101	Same as T6100	
T6102	Same as T6100	
T6103	Same as T6100	
T6120	Same as T6100	
T6121	Same as T6100	
T6122	Same as T6100	
T6123	Same as T6100	
	Connector, 47217	DCN033051

KEY BOARD 62

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C6200	Cap., 0.01μ, ±10%, 50V, Cer	DCC133571
C6201	Same as C6200	
C6202	Same as C6200	
C6203	Same as C6200	
C6204	Same as C6200	
C6205	Same as C6200	
C6206	Same as C6200	
C6207	Same as C6200	
C6208	Same as C6200	
C6250	Cap., 10μ, ±20%, 10V, Elect. tan	DCS439021
C6251	Same as C6250	
C6252	Same as C6250	
C6253	Same as C6250	
C6254	Same as C6250	
C6255	Same as C6250	
CA6200	Capacitor array, QA102-09	DCC990141
R6200	Res., 1.0K, ±5%, 1/5W, Carbon	DRD939251
R6201	Res., 6.2K, ±5%, 1/5W, Carbon	DRD938051
R6210	Res., 270, ±5%, 1/5W, Carbon	DRD939181
R6211	Same as R6210	
RA6200	Resistor array, 2S-1.2KJ	DFB018001
RA6201	Resistor array, 3S-1.2KJ	DFB018011
RA6202	Resistor array, IHR-4-511J-911JE	DFB014331
RA6203	Resistor array, IHR-6-511J-911JE	DFB014351
RA6204	Resistor array, 6-120J	DFB018021
RA6205	Resistor array, 2S-100J	DFB017991
RA6206	Resistor array, 4S-100J	DFB016411
RA6207	Resistor array, 8-100J	DFB016601
RA6208	Resistor array, 7-100J	DFB018031
RA6209	Resistor array, IHR-8-750JA	DFB014311
RA6210	Resistor array, IHR-7-750JA	DFB014301
RA6211	Resistor array, IHR-5-750JA	DFB014291
RA6212	Same as RA6211	
RA6213	Same as RA6206	
RA6214	Same as RA6206	
RA6215	Same as RA6205	
RA6216	Same as RA6206	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
D6200	L. E. D., BU1170-4PY	DDD072051
D6201	Same as D6200	
D6202	Same as D6200	
D6203	Same as D6200	
D6204	Same as D6200	
D6205	Same as D6200	
D6206	Same as D6200	
D6207	Same as D6200	
D6208	Same as D6200	
D6209	Same as D6200	
D6210	Same as D6200	
D6211	Same as D6200	
D6212	Same as D6200	
D6213	Same as D6200	
D6214	Same as D6200	
D6215	Same as D6200	
D6216	Same as D6200	
D6217	Same as D6200	
D6218	Same as D6200	
D6219	Same as D6200	
D6220	Same as D6200	
D6221	Same as D6200	
D6222	Same as D6200	
D6223	Same as D6200	
D6224	Same as D6200	
D6225	Same as D6200	
D6226	Same as D6200	
D6227	Same as D6200	
D6228	L. E. D., BU 1170-4BG	DDD072061
D6229	Same as D6228	
D6230	Same as D6228	
D6231	Same as D6228	
D6232	Same as D6228	
D6233	Same as D6228	
D6234	Same as D6228	
D6235	Same as D6228	
D6236	Same as D6228	
D6237	Same as D6228	
D6238	Same as D6228	
D6239	Same as D6228	
D6240	Same as D6228	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
D6241	Same as D6228	
D6242	Same as D6228	
D6243	Same as D6228	
D6244	Same as D6228	
D6245	Same as D6228	
D6246	Same as D6228	
D6247	Same as D6228	
D6248	Same as D6228	
D6249	Same as D6228	
D6250	Same as D6228	
D6251	Same as D6228	
D6252	Same as D6228	
D6253	Same as D6200	
D6254	Same as D6200	
D6255	Same as D6200	
D6256	Same as D6200	
D6257	Same as D6200	
D6258	Same as D6200	
D6259	Same as D6200	
D6260	L. E. D., BU 1170-4AA	DDD072041
D6261	Same as D6260	
D6262	Same as D6260	
D6263	Same as D6260	
D6264	Same as D6260	
D6265	L. E. D., BR3433S	DDD070561
D6266	Same as D6265	
D6267	Same as D6260	
D6268	Same as D6200	
D6269	Same as D6200	
D6270	Same as D6200	
D6271	Same as D6200	
D6272	Same as D6200	
D6273	Same as D6200	
D6274	Same as D6200	
D6275	Same as D6200	
D6276	Same as D6200	
D6277	Same as D6200	
D6278	Same as D6200	
D6279	Same as D6200	
D6290	L. E. D., BG 3433S	DDD072221
D6291	Same as D6290	
D6292	Same as D6290	
D6293	Same as D6290	
D6294	Same as D6290	
D6295	Same as D6290	
Q6200	Transistor, 2SA952 L/K, NEC	DTR115201
Q6201	Same as Q6200	
Q6202	Same as Q6200	
Q6203	Same as Q6200	
Q6204	Same as Q6200	
Q6205	Same as Q6200	
Q6206	Same as Q6200	
Q6207	Same as Q6200	
Q6208	Same as Q6200	
Q6209	Same as Q6200	
Q6210	Transistor, 2SC 1815GR, TOS	DTR139011
IC6200	IC, MC74HC 138N	DIC441391
IC6201	Same as IC6200	
IC6202	IC, MC74HC 164N	DIC441651
IC6203	IC, SN7417N, TEXS, HIT	DIC110181
IC6204	IC, 74F174PC	DIC198341
IC6205	IC, SN74LS374N	DIC142941
IC6206	Same as IC6205	
IC6207	Same as IC6205	
IC6208	Same as IC6204	
IC6209	IC, 74F244PC	DIC198181
S6201	Switch, KHH 10906	DSW018481
S6202	Same as S6201	
S6203	Same as S6201	
S6205	Same as S6201	
S6206	Same as S6201	
S6207	Same as S6201	
S6210	Same as S6201	
S6211	Same as S6201	
S6212	Same as S6201	
S6213	Same as S6201	
S6214	Same as S6201	
S6215	Same as S6201	
S6216	Same as S6201	
S6217	Same as S6201	
S6220	Same as S6201	
S6221	Same as S6201	
S6222	Same as S6201	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
S6223	Same as S6201	
S6224	Same as S6201	
S6225	Same as S6201	
S6226	Same as S6201	
S6227	Same as S6201	
S6230	Same as S6201	
S6231	Same as S6201	
S6232	Same as S6201	
S6235	Same as S6201	
S6236	Same as S6201	
S6237	Same as S6201	
S6240	Same as S6201	
S6241	Same as S6201	
S6242	Same as S6201	
S6243	Same as S6201	
S6245	Same as S6201	
S6246	Same as S6201	
S6247	Same as S6201	
S6250	Same as S6201	
S6251	Same as S6201	
S6254	Same as S6201	
S6255	Same as S6201	
S6256	Same as S6201	
S6257	Same as S6201	
S6260	Same as S6201	
S6261	Same as S6201	
S6262	Same as S6201	
S6263	Same as S6201	
S6264	Same as S6201	
S6266	Same as S6201	
S6267	Same as S6201	
S6270	Same as S6201	
S6271	Same as S6201	
S6272	Same as S6201	
S6273	Same as S6201	
S6274	Same as S6201	
S6275	Same as S6201	
S6276	Same as S6201	
S6277	Same as S6201	
J6200	Connector, 65043-022, BAR	DCN031671
	Connector, 47217, BAR	DCN033051

INTERFACE MOTHER 63

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C6300	Cap., 0.1μ, +80~-20%, 50V, Cer	DCC137091
C6301	Cap., 0.01μ, ±10%, 50V, Cer	DCC133571
R6300	Res., 10K, ±5%, 1/5W, Carbon	DRD939371
R6301	Same as R6300	
IC6300	IC, MC 74HC138N	DIC441391
IC6301	Same as IC6300	
IC6302	IC, MC 74HC125N	DIC441261
IC6303	IC, MC 74HC10N	DIC440111
J6300	Connector, 00 8272 348 949 163	DCN991411
P6300	Straight header 65611-172, BAR	DCN033541

GP-IB 64

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C6400	Cap., 0.1μ, 80~-20%, 50V, Cer	DCC137091
C6402	Same as C6400	
C6403	Same as C6400	
C6404	Cap., 39pF, ±5%, 50V, Cer	DCC239131
R6400	Res., 6.8K, ±5%, 1/5W, Carbon	DRD939351
R6401	Res., 750, ±5%, 1/5W, Carbon	DRD939971
RA6400	Resistor array, 7-10KΩJ	DFB015591
Q6400	Transistor, 2SC1907, NEC	DTR139061
IC6400	IC, μPD7210C, NEC	DIC555631
IC6401	IC, MC74HC244N	DIC442451
IC6402	IC, SN75160AN, TEXS	DIC196181
IC6403	IC, SN75161AN, TEXS	DIC196191
S6400	Dip Switch, DTS-8, MAT	DSW105561
J6400	Connector, 57-20240-8035, DDK	DCN020311
P6400	Connector, 00-8272-348-000-163	DCN992231

RS-232-C 65

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART NO.
C6500	Cap., 0.1μ, +80~-20%, 50V, Cer	DCC137091
C6501	Cap., 0.01μ, +80~-20%, 50V, Cer	DCC929031
C6502	Cap., 220p, ±5%, 50V, Cer	DCC239171
C6503	Same as C6502	
R6500	Res., 470, ±5%, 1/5W, Carbon	DRD939211
R6501	Res., 4.7K, ±5%, 1/5W, Carbon	DRD939331
R6502	Same as R6501	
RA6500	Resistor array, 7-10KΩJ	DFB015591
IC6500	MC68661PA, MOTOR ROLLER	DIC555661
IC6501	MC74HC244N	DIC442451
IC6502	HD75188P, HIT	DIC197071
IC6503	SN75189AN, TEXS	DIC196171
IC6504	MC74HC00N	DIC440011
IC6505	Same as IC6504	
S6500	Dip switch DTS-8	DSW105561
S6501	Dip switch DTS-2	DSW105531
P6500	Connector, 00-8272-348-000-163	DCN992231
J6500	Connector, DB-25ST-N	DCN022491
X6500	Crystal OSC, 4.9152MHz	DHF010571

POWER SUPPLY 66

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART No.
66C1	Cap., 2200p, ±20%, 400V, Cer.	DCC140131
66C2	Same as 66C1	
66C3	Cap., 0.1μ, ±20%, 250V, Film	DCF160361
66C4 to 6	Same as 66C3	
66C7	Same as 66C1	
66C8	Cap., 220μ, Var., 400V, Elect.	DCE985041
66C9	Same as 66C8	
66C10	Cap., 0.1μ, ±10%, 400V, Film	DCF168261
66C11	Cap., 470p, ±10%, 2,000V, Cer.	DCC163201
66C12	Cap., 0.033μ, ±10%, 50V, Film	DCF121381
66C13	Cap., 0.047μ, ±10%, 400V, Elect.	DCF168251
66C14	Cap., 0.01μ, ±10%, 50V, Film	DCF121321
66C15	Cap., 220μ, ±20%, 25V, Elect.	DCE925801
66C16	Cap., 0.1μ, ±10%, 50V, Film	DCF121441
66C17	Cap., 1000μ, ±20%, 10V, Elect.	DCE915511
66C18	Cap., 0.047μ, ±10%, 50V, Film	DCF121401
66C19	Cap., 47μ, ±20%, 25V, Elect.	DCE925781
66C20	Cap., 2200p, ±10%, 50V, Film	DCF121241
66C21	Cap., 4700p, ±10%, 50V, Film	DCF121281
66C22	Cap., 220p, ±10%, 2000V, Cer.	DCC163171
66C23	Same as 66C22	
66C24	Cap., 1000p, ±10%, 2000V, Cer.	DCC163191
66C25	Same as 66C24	
66C26	Cap., 10μ, 20%, 50V, Elect.	DCE960401
66C27	Cap., 220μ, 20%, 63V, Elect.	DCE945421
66C28	Cap., 1000μ, 20%, 25V, Elect.	DCE925831
66C29 to 31	Same as 66C28	
66C32	Cap., 820p, ±20%, 10V, Elect.	DCE915311
66C33	Same as 66C32	
66C34	Cap., 33μ, ±20%, 10V, Elect.	DCE915291
66C35, 36	Same as 66C32	
66C37	Cap., 0.22μ, ±10%, 50V, Film	DCF129711
66C38	Cap., 0.01μ, ±10%, 50V, Film	DCF121321
66C39	Same as 66C38	
66C40, 41	Same as 66C26	
66C42, 43	Same as 66C27	
66C44	Cap., 2200μ, ±20%, 25V, Elect.	DCE925841
66C45 to 47	Same as 66C44	
66C48, 49	Same as 66C17	
66C50 to 54	Same as 66C17	
66C55	Cap., 0.1μ, ±10%, 630V, Film	DCF179051
66C56	Cap., 0.15μ, ±10%, 50V, Film	DCF121461
66C57	Cap., 10μ, ±20%, 50V, Elect.	
66C58	Same as 66C19	
66C59	Cap., 47μ, ±20%, 63V, Elect.	DCE945401
66C60 to 64	Same as 66C18	
66C66, 67	Same as 66C1	
66C68	Cap., 47μ, ±20%, 25V, Elect.	DCE925821
66C69	Same as 66C13	
66L1	Common mode choke FS-38191	DCL152171
66L2, 3	Same as 66L1	
66L4	Coil, SN-12-500	DCL111131
66L5	Same as 66L4	
66L7	Choke coil, (2) FS37555	DCL112551
66L8	Same as 66L7	
66C9	Choke coil, (3) FS 37556	DCL112561
66L10 to 12	Same as 66L7	
66R1	Res., 22K, ±5%, 2W, Metal	DRS330611
66R2	Fusible Resistor, A53K-10ΩJ	DRZ010181
66R3	Res., 1.0K, ±5%, 1/4W, Carbon	DRD137641
66R4	Res., 22, ±1%, 1/2W, Metal	DRE140431
66R7	Res., 10, ±5%, 1/4W, Carbon	DRD930091
66R8	Res., 470, ±5%, 2W, Metal	DRS330411
66R9	Res., 47K, ±5%, 1W, Metal	DRS320651
66R10	Res., 470K, ±5%, 1/4W, Carbon	DRD138281
66R11	Res., 120, ±5%, 1/4W, Carbon	DRD137421
66R12	Res., 3.3, ±5%, 1/4W, Carbon	DRD930031
66R13	Res., 3.3, ±5%, 1W, Metal	DRS320151
66R14	Res., 100, ±5%, 1/4W, Carbon	DRD137401
66R15	Res., 330, ±5%, 1/4W, Carbon	DRD137521
66R16	Res., 100, ±5%, 1/4W, Carbon	DRD137401
66R17	Res., 3.0K, ±5%, 1/4W, Carbon	DRD137751
66R18	Res., 3.3K, ±5%, 1/4W, Carbon	DRD137761
66R19	Res., 33K, ±5%, 1/4W, Carbon	DRD138001
66R20	Res., 30, ±1%, 1/4W, Metal	DRE137511
66R21	Res., 100, ±1%, 1/4W, Metal	DRE137641
66R22	Res., 15K, ±5%, 1/4W, Carbon	DRD137921
66R23	Same as 66R18	
66R24	Res., 5.6K, ±5%, 1/4W, Carbon	DRD137821
66R25	Res., 2.2K, ±5%, 1/4W, Carbon	DRD137721
66R26	Res., 11K, ±5%, 1/4W, Carbon	DRD137891
66R27	Same as 66R3	

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART No.
66R28	Res., 16K, ±5%, 1/4W, Carbon	DRD137931
66R29	Res., 10K, ±5%, 1/4W, Carbon	DRD137881
66R30	Same as 66R22	
66R31	Res., 47, ±5%, 2W, Metal	DRS330291
66R32	Res., 220, ±5%, 2W, Metal	DRS330371
66R33, 34	Same as 66R32	
66R35	Res., 10, ±5%, 1/4W, Carbon	DRD137161
66R36	Res., 0.05, ±10%, 2W, Metal	DRE960141
66R37	Same as 66R35	
66R38	Res., 12, ±5%, 1/4W, Carbon	DRD137181
66R39	Res., 470, ±5%, 1/4W, Carbon	DRD137561
66R40	Res., 680, ±5%, 2W, Metal	DRS330431
66R41	Res., 2.2, ±5%, 1W, Metal	DRS320131
66R42	Res., 18K, ±5%, 1/4W, Carbon	DRD137941
66R43	Res., 75, ±1%, 1/4W, Metal	
66R44	Res., 12K, ±1%, 1/4W, Metal	DRE138141
66R45	Res., 130K, ±1%, 1/4W, Metal	DRE138391
66R46	Res., 33K, ±5%, 1/4W, Carbon	DRD138001
66R47	Res., 6.8K, ±5%, 1/4W, Carbon	DRD137841
66R48	Res., 39K, ±1%, 1/4W, Metal	DRE138261
66R49	Res., 1.0K, ±1%, 1/4W, Metal	DRE137881
66R50	Same as 66R44	
66R51	Same as 66R47	
66R52	Res., 0.47, ±10%, 2W, Metal	DRE960161
66R53	Same as 66R52	
66R54	Res., 4.3K, ±1%, 1/4W, Metal	DRE138031
66R55	Same as 66R44	
66R56	Same as 66R47	
66R57	Same as 66R44	
66R58	Same as 66R47	
66R59	Res., 3.9K, ±5%, 1/4W, Carbon	DRD137781
66R60	Res., 0.33, ±10%, 2W, Metal	DRE960151
66R61	Res., 5.1K, ±1%, 1/4W, Metal	DRE138051
66R62	Same as 66R61	
66R63	Same as 66R47	
66R64	Res., 0.68, ±10%, 2W, Metal	DRE960171
66R65	Res., 3.0K, ±1%, 1/4W, Metal	DRE137991
66R66	Res., 2.0K, ±1%, 1/4W, Metal	DRE137951
66R67	Same as 66R44	
66R68	Same as 66R47	
66R69	Res., 390, ±5%, 1/4W, Carbon	DRD137541
66R70	Same as 66R25	
66R71	Same as 66R69	
66R72	Same as 66R3	
66R73	Res., 7.5K, ±5%, 1/4W, Carbon	DRD137851
66R74	Same as 66R3	
66R75	Res., 8.2K, ±5%, 1/4W, Carbon	DRD137861
66R76	Same as 66R29	
66R77	Res., 220, ±5%, 1/4W, Carbon	DRD137481
66R78	Same as 66R3	
66R79	Res., 100K, ±5%, 1/4W, Carbon	DRD138121
66R80	Same as 66R79	
66R81	Same as 66R3	
66R82	Res., 1.0, ±5%, 1/4W, Carbon	DRD939711
66R83	Same as 66R15	
66R84	Same as 66R29	
66R86	Same as 66R79	
66R87	Same as 66R73	
66R88	Same as 66R79	
66R89	Res., 33, ±5%, 2W, Metal	DRS330271
66D1	Diode, EM01 TA21R	DDD029091
66D2	Diode, 1S 953 TA21R	DDD010821
66D3	Diode, RG1C	DDD021481
66D4	Same as 66D3	
66D5	Diode, RD3.0ESB/HZS3.0NB TA21R	DDD038641
66D6	Diode, EU2	DDD023441
66D7	Same as 66D2	
66D8	Diode, RD8.2ESR/HZS8.2NB TA21R	DDD038751
66D9, 10	Same as 66D6	
66D11, 12	Same as 66D2	
66D13, 14	Same as 66D3	
66D16	Diode, SIS4M	DDD023671
66D17	Diode, RD39ESB/HZS39NB TA21R	DDD038911
66D18	Same as 66D2	
66D19	Diode, RD18ESB 1HZS 18NR TA21R	DDD038831
66D20	Same as 66D2	
66D21 to 26	Same as 66D1	
66D27	Same as 66D2	
66D28	Same as 66D19	

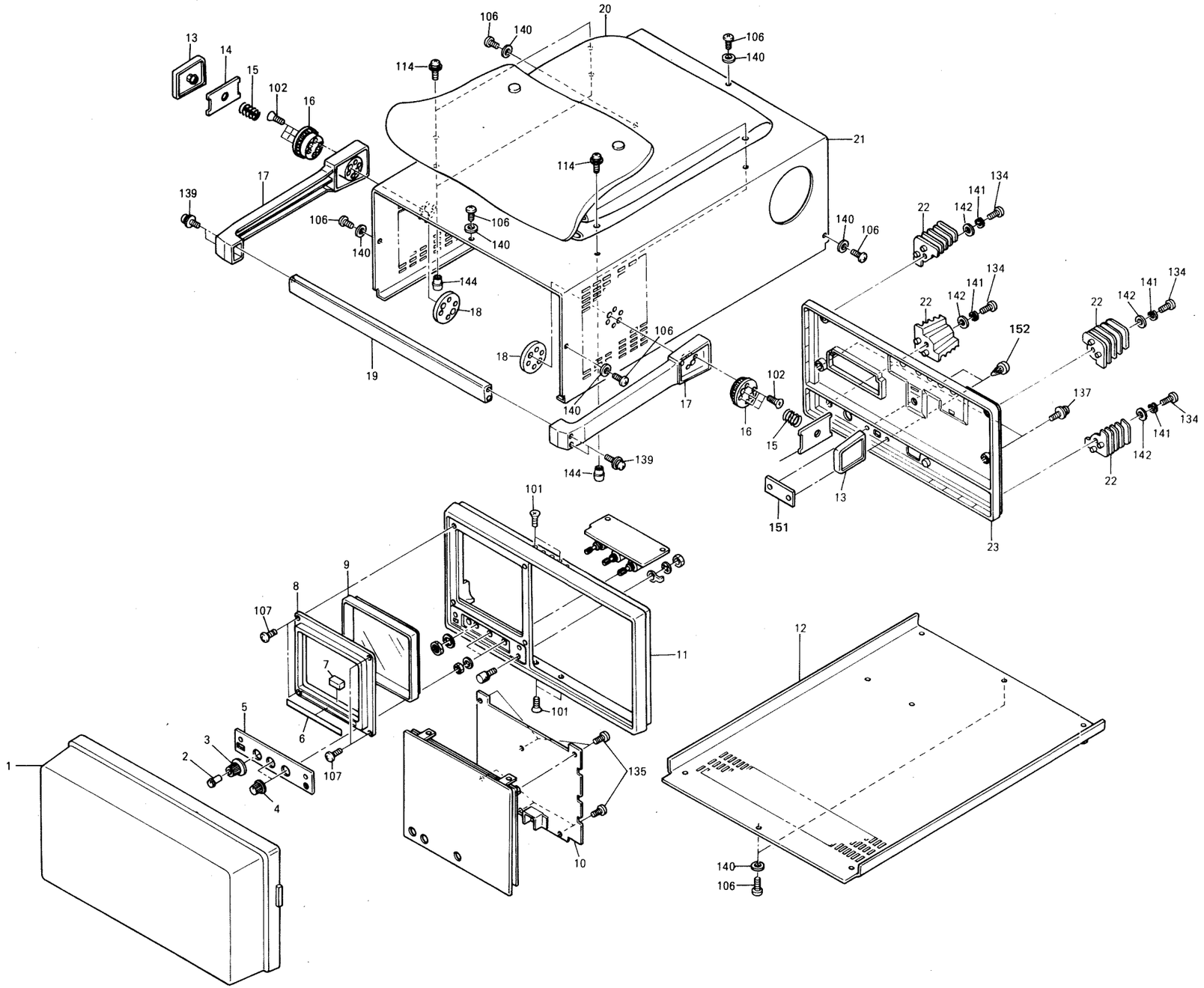
CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART No.
66D29	Diode, RD5.6ESB/HZS5.6NB TA21R	DDD038711
66D30, 31	Same as 66D2	
66D32	Same as 66D19	
66D34	Same as 66D29	
66DS1	Diode, S4VB60	DDD023451
66DS2	Diode, 10DL2C	DDD021471
66DS3, 4	Same as 66DS2	
66DS5	Diode, D10SC6M	DDD023461
66Q1	Transistor, 2SC 3262	DTR136271
66Q2	Transistor, 2SC 3148	DTR137511
66Q3	Transistor, 2SC 3179Y	DTR135781
66Q4	Transistor, 2SK 30ATM-GR	DTR215181
66Q5	Transistor, 2SA 1020	DTR115001
66Q6	Transistor, 2SA 1015Y TPER1	DTR119011
66Q7	Transistor, 2SC 1815GR TPER1	DTR139011
66Q8	Transistor, 2SA 968B-Y	DTR115351
66Q9	Transistor, 2SA 1091-0	DTR115121
66Q10	Transistor, 2SC 2315	DTR136281
66Q11	Transistor, 2SC 2551	DTR136181
66Q12	Same as 66Q9	
66Q13	Same as 66Q11	
66Q14	Same as 66Q8	
66Q15, 16	Same as 66Q6	
66Q17	Same as 66Q10	
66Q18	Same as 66Q7	
66Q19	Transistor, 2SB 834	DTR125481
66Q20	Same as 66Q6	
66Q21	Same as 66Q4	
66Q22	Same as 66Q6	
66Q23	Same as 66Q10	
66Q24	Same as 66Q7	
66Q25	Same as 66Q4	
66Q26	Same as 66Q19	
66IC1	IC., MB 3759M	DIC690231
66IC2	IC., TA 75559P	DIC613321
66IC3, 4	Same as 66IC2	
66S1	Switch, SDGA3P-B	DSW016541

CIRCUIT REFERENCE	DESCRIPTION	IWATSU PART No.
66J1	Connector, 5557-2R	DCN993351
66J2	Same as 66J1	
66J3	Connector, M36M87-02	DCN034601
66J4	Connector, FS-38573	KHB093011
66J5	Same as 66J4	
66J7	Connector, M36M87-06	DCN034641
66J8, 9	Same as 66J7	
66J10	Connector, M36M87-04	DCN034621
66J11	Connector, M36M87-02	DCN034601
66J12 to 14	Same as 66J11	
66P1	Connector, 5566-2A	DCN993331
66P2	Same as 66P1	
66P4	Connector, 5089-08A	DCN993821
66P5	Same as 66P4	
66P6	Connector, 128-08-10-281P	DCN032071
66P7	Connector, M36-06-30-114P	DCN034891
66P8, 9	Same as 66P7	
66P10	Connector, M36-04-30-114P	DCN034871
66P11	Connector, M36-02-30-114P	DCN034851
66P12 to 14	Same as 66P11	
66T1	Output Trance, FS-37824-21	DCL230891
66T2	Trance, FS-37825	DCL210331
66T3	Drive Trance FS 37800	DCL240581
66F	Fuse, TSC 3A 250V	DFV025291
66F	Fuse holder, FH033	DSK065361
66CR1	Traiac, BCR6AM-12L	DDD040491
66VR1	Res., 1K, Var., 1/2W, Cermet	DRV410651
66P	Inlet, NC-173A	DCN013311
66PB	Power Supply	KPN260421
66FAN	Fan mortor, SJ-80Y 12A	DMT620311
66PC1	Photo Coupler, TLP521-1	DFB030331

Section 7 Mechanical Parts List and Illustration

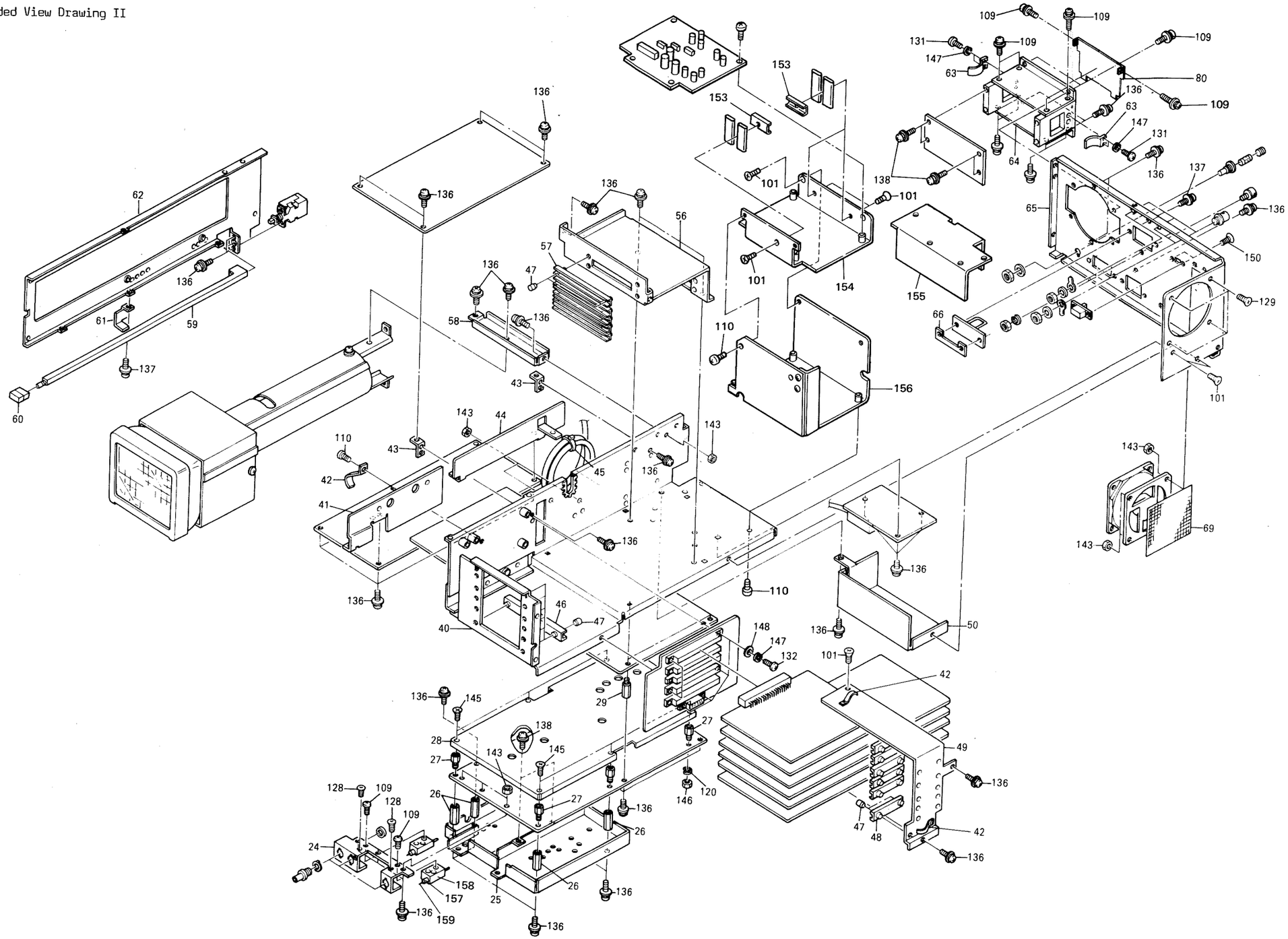
INDEX NO.	NAME & DESCRIPTION	Q'ty	IWATSU PART NO.
1	COVER, panel	1	KCM059921
2	KNOB	1	KCM061111
3	KNOB	1	KCM061011
4	KNOB	2	KCM061411
5	PANEL ASY, power	1	KAS064711
6	NAME PLATE, title	1	KRA133511
7	STOPPER, filter	1	KPL013411
8	BEZEL	1	KCM060321
9	FILTER BOARD B	1	KPL102811
10	SHIELDED PLATE, key-board	1	KBA603731
11	SUB PANEL, front	1	KPA176421
12	COVER, lower	1	KBA602221
13	COVER of rotor-arm	2	KCM059521
14	SPRING SUPPORT	2	KBA508121
15	SPRING, handle arm	2	KSR012611
16	STATOR GEAR	2	KCM059621
17	ROTOR-ARM of handle	2	KCM070611
18	ROTOR-GEAR SUPPORT	2	KBA512531
19	COVER, handle ℓ=306	1	KCM070111
20	ACCESSORIES BAG	1	KLT028111
21	COVER, upper	1	KBA602141
22	FOOT	4	KCM083811
23	PANEL, rear	1	KPA176811
101	SCREW KD–3 x 8S	6	MKD130081
102	SCREW KD–3 x 18S	12	MKD131081
106	SCREW KT–3 x 8B	4	MKT230082
107	SCREW KT–3 x 10B	4	MKT230102
114	SCREW SM5–3 x 8	4	MSM530081
134	SCREW KP–4 x 30S	4	MKP140301
137	SCREW SM4–3 x 10	2	MSM430101
139	SCREW SM4–3 x 12S	4	MSM430121
140	WASHER NYLON 3	8	MPW930000
141	SPRING WASHER SW–4S	4	MSW140001
142	WASHER W–4S	4	MWW140001
144	NUT INSERT M3	4	KSQ002311
151	SCREW KH–3 x 8S	4	KSQ003311

Figure 7-1. Exploded View Drawing I



INDEX NO.	NAME & DESCRIPTION	Q'ty	IWATSU PART NO.
24	CONNECTOR FIXED BOARD	1	KBA603221
25	SHIELDED PLATE, attenuater (upper)	1	KBA603321
26	STAY SBH (5.5) 1930B0	4	KMM159411
27	STAY (N)	5	KMM226411
28	SHIELDED PLATE, attenuater (lower)	1	KBA603521
29	STAY (M)	2	KMM226511
40	CHASSIS	1	KBA601951
41	SHIELDED PLATE, front	1	KBA602631
42	SPRING, ground	3	KBA520831
43	PRINTED BOARD SUPPORT	2	KBA603011
44	SHIELDED PLATE, rear	1	KBA602731
45	BAND, CV-100	4	MHK000461
46	GUIDE, (PCB)	1	KCM065311
47	GUIDE LOCK PIN	36	KCM066411
48	GUIDE, (PCB)	12	KCM065411
49	PRINTED BOARD FIXTURE	1	KBA603141
56	GUIDE (PCB)	1	KBA602421
57	GUIDE (PCB)	6	KCM065311
58	CRT FIXTURE	1	KBA604121
59	EXTENSION SHAFT POWER SWITCH	1	KCM076221
60	PS knob C1	1	KCM061911
61	EXTENSION SHAFT FIXTURE	1	KBA612321
62	SIDE COVER, left	1	KBA602031
63	HOLDER SPRING	2	KBA604011
64	HOLDER COVER, lower	1	KBA603921
65	SUB-PANEL, rear	1	KBA176531
66	SEAT PLATE	1	KBA526711
67	SEAT PLATE	1	KBA526611
69	MESH	1	KSN027921
80	HOLDER COVER	1	KBA619611
101	SCREW KD–3 x 8S	9	MKD130081
102	SCREW KD–3 x 18S	12	MKD130181
103	SCREW KP–3 x 12S	1	MKP130121
109	SCREW SM1–2.6 x 6CT	11	MSM126061
110	SCREW SM1–3 x 6	5	MSM130061
120	SPRING WASHER SW–3S	3	MSW130001
121	WASHER W–3S	1	MWW130001
128	SCREW KD–2.6 x 6S	2	MKD126061
129	SCREW KD–3 x 12S	4	MKD130121
131	SCREW KP–2.6 x 4S	4	MKP126041
132	SCREW KP–2.6 x 10S	8	MKP126101
133	SCREW KP–3 x 18S	1	MKP130181
136	SCREW SM4–3 x 8	43	MSM430081
137	SCREW SM4–3 x 10	4	MSM430101
138	SCREW SM5–2.6 x 6	3	MSM526061
143	PRESS NUT M3	14	MSQ910061
145	SCREW KD–3 x 4S	2	MKD130041
146	NUT N–3S	2	NUT130001
147	SPRING WASHER SW–2.6S	6	MSW126000
148	WASHER W–2.6S	6	MWW126001
149	WASHER PW–3	1	MPW130001
150	SCREW KD–2 x 4S	2	MKD120041
151	MASK PLATE	1	KBA662511
152	PLASTIC RIVET	2	MFA001131
153	TRANSISTOR SUPPORTED PLATE	2	KBA634511
154	SHIELDED PLATE	1	KBA662811
155	FILTER BOARD SUPPORT	1	KBA662911
156	POWER SUPPLY CASE	1	KBA662611
157	PROBE HOLDER	2	KPL117821
158	PROBE MOUNT	2	KPL117921
159	CONTACT PROBE C-10T	2	DZB020551

Figure 7-2. Exploded View Drawing II



INDEX NO.	NAME & DESCRIPTION	Q'ty	IWATSU PART NO.
70	CRT CUSHION	1	KGM009631
71	LAMP HOUSING	1	KCM056111
72	CRT SHIELD CASE A	1	KBA513221
73	CASE SUPPORTOR	1	KBA513421
74	CRT SHIELD CASE B	1	KBA513311
75	CRT FIXED RUBBER	1	KGM009511
76	CRT FIXED BAND	1	KBA603611
81	CASE SUPPORTOR	1	KBA513521
110	SCREW SM1–3 x 6	3	MSM130061
120	SPRING WASHER SW–3S	5	MSW130001
121	WASHER W–3S	2	MWW130001
133	SCREW KP–3 x 18S	2	MKP130181
136	SCREW SM4–3 x 8	46	MSM430081
149	WASHER PW–3	2	MPW130004

Figure 7-3. Exploded View Drawing III